

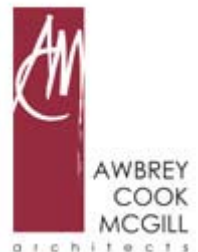
**LUHRS MARRIOTT COURTYARD /
RESIDENCE INN**

132 S. Central Avenue
Phoenix, AZ

Final Bidding

Final for Construction
June 18, 2015

Developed for:
Awbrey Cook Rogers McGill Architects
San Diego, CA



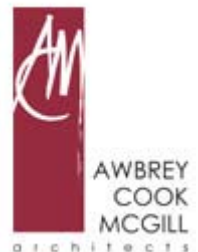
LUHRS MARRIOTT COURTYARD / RESIDENCE INN

132 S. Central Avenue
Phoenix, AZ

Final Bidding

Final for Construction
June 05, 2015

Developed for:
Awbrey Cook Rogers McGill Architects
San Diego, CA



- SECTION 00 0005 -

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Appendix B	Acoustical Report - Noise Control Recommendations for the Party Wall and Floor/Ceiling Assemblies for “Luhrs City Center Marriott”, City of Phoenix, Arizona, Project #541101-0200 – 15 pages
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Appendix D	Laundry Equipment
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Appendix F	Fire and Life Safety Report
Appendix G	Rational Analysis Report
Appendix H	Marriott, Module 14, Fire Protection & Life Safety Standards
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- SECTION 01 1100 -**SUMMARY OF WORK**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work by Owner.
 - 5. Work under separate contracts.
 - 6. Future work.
 - 7. Purchase contracts.
 - 8. Owner-furnished products.
 - 9. Contractor-furnished, Owner-installed products.
 - 10. Access to site.
 - 11. Coordination with occupants.
 - 12. Work restrictions.
 - 13. Specification and drawing conventions.
 - 14. Miscellaneous provisions.

1.3 RELATED REQUIREMENTS:

- A. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.4 PROJECT INFORMATION

- A. Project Identification: Luhrs Marriott Courtyard and Residence Inn, ACMA Project No. 12-1601.
 - 1. Project Location: Madison and Central Avenue, Phoenix, AZ.
 - a. 132 S. Central Ave., Phoenix, AZ.

- B. Owner: LUHRS, CM, LLC
 - 1. Owner's Representative: John Bissell.
- C. Architect: Awbrey Cook McGill Architect, San Diego, CA.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. Hotel Building, approximately 240,000 GSF, 315 guestrooms for both Courtyard and Residence Inn and guest services support areas.
 - a. Basement level will include support spaces include, but not limited to the following rooms; Emergency Generator, Fire Pump, Air Handling, Laundry, APS Vault, Employee breaks, Lockers, Electrical, Elevators, Stairs and Back of House facilities.
 - b. Ground floor will include lobbies (for both hotels) with check-in desks and concierge desks, formal main entrances, Administrative offices, Trask/Recycling room, Bar and Kitchen facilities, Elevators, Stairs and Back of House facilities.
 - c. Second level will include, but not limited to the following rooms; Buffett and Breakfast, Restrooms, Elevators, Stairs and Back of House facilities.
 - d. Third level will include, but not limited to the following rooms; Meeting, Banquet Staging, Restrooms, Elevators, Stairs and Back of House facilities.
 - e. Fourth level will include, but not limited to the following rooms; Indoor swimming pool, Open Bar, Fitness, Elevators, Stairs and Back of House facilities.
 - f. Upper levels include Guest rooms, Elevators, Stairs and Back of House facilities.
 - g. Exterior improvements include pedestrian walkways, planters, seating, loading/unloading area off street, landscaped areas and entries.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.6 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
 - 1. Refer to the Construction Agreement for requirements.
- C. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Refer to the Construction Agreement for requirements.
- D. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.
 - 1. Refer to the Construction Agreement for requirements.

SUMMARY OF WORK

1.7 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Preceding Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
 - 1. Refer to the Construction Agreement for requirements.
- C. Concurrent Work: Owner will assign to Contractor separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Refer to the Construction Agreement for requirements.
- D. Subsequent Work: Owner will award separate contract(s) for the following additional work to be performed at site following Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.
 - 1. Refer to the Construction Agreement for requirements.

1.8 FUTURE WORK

- A. The Contract Documents include requirements that will allow Owner to carry out future work following completion of this Project; provide for the following future work:
 - 1. Refer to the Construction Agreement for requirements.

1.9 PURCHASE CONTRACTS

- A. General: Owner has negotiated purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
 - 1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.
- B. Purchase Contracts Information:
 - 1. Refer to the Construction Agreement for requirements.

1.10 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
- B. Owner-Furnished Products:
 - 1. Refer to Drawings.
 - 2. Refer to Construction Agreement

1.11 CONTRACTOR-FURNISHED, OWNER-INSTALLED PRODUCTS

- A. Contractor shall furnish products indicated. The Work includes unloading, handling, storing, and protecting Contractor-furnished products as directed and turning them over to Owner at Project closeout.
- B. Contractor-Furnished, Owner-Installed Products:
 - 1. Refer to Drawings.
 - 2. Refer to Construction Agreement

1.12 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Refer to Construction Agreement
 - 2. Limits: Confine construction operations to;
 - a. Refer to Construction Agreement
 - 3. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.13 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

SUMMARY OF WORK

- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.14 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to normal business working hours of October 1st – April 30: 7:00am to 7:00pm and May 1st – September 30: 6:00am to 7:00pm Monday through Friday, unless otherwise indicated or unless contractor applies for and obtains an “Extended Construction Work Hours” permit.
1. Weekend Hours:
 - a. October 1st – April 30: 7:00am to 7:00pm and May 1st – September 30: 6:00am to 7:00pm
 - 1) Contractor shall obtain an “Extended Construction Work Hours” permit for other hours.
 - 2) Refer to City of Phoenix requirements.
 2. Early Morning Hours:
 - a. Contractor shall obtain a “Extended Construction Work Hours” permit for other hours then specified.
 3. Hours for Utility Shutdowns:
 - a. Refer to Agreement for Construction.
 - b. Refer to Utility company(s) requirements.
 4. Hours for Core Drilling:
 - a. Refer to Agreement for Construction.
 - b. Refer to City of Phoenix requirements.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
 2. Obtain Owner’s written permission before proceeding with utility interruptions.

- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.15 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.16 MISCELLANEOUS PROVISIONS

- A. Refer to Construction Agreement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
<u>Building Exterior</u>							
Exterior building light fixtures (attached)		✓					
Exterior canopies (and canopy lighting)		✓					
Exterior landscape lighting and street lighting		✓					
Exterior building signs and graphics (including lighting)	GC power and backing			✓			
Exterior illuminated hotel logo signage power only	3 locations 80A/480V feeds only	✓					
Roll down security doors		✓					
Exterior brick tile and pavers		✓					
Exterior entrance doors		✓					
Automatic entrance doors and controls	Verify locations	✓					
Front entry intercom and door release at front desk	Power and conduit included	✓					
Landscaping including irrigation systems	Streets	✓					
Major exterior building planters	Built-in planters included	✓					
Precast planter pots and boxes (incl plants)		✓					
Portable planters, small pots, and hanging pots				✓			
Valet Parking millwork and stand (incl window)	Millwork item	✓					
Ash urns and exterior trash containers						✓	
Site walls, fences, and enclosures, gates		✓					
Screen walls at equipment or service areas		✓					
Trash compactor - MEP hook-ups by GC	Including four bins			✓			
Exterior recreational facilities (fence and gates)		✓					
Protective bollards, and site railings		✓					
Parking garage signs and traffic mirrors				✓			
Street lights/Signage		✓					
Pool systems (including systems, equipment, pumps)		✓					
Handicap lift		✓					
Pool furnishings, ladders, stands, pool sweep		✓					
Custom graphics and logo art	Brand & property graphics					✓	
Parking control equipment (controllers, gates, arms)	Existing to remain						
A/V System	Cable, boxes & speakers by GC			✓			
Exterior flagpoles	Flags by owner	✓					
Decorative shrouds for trash receptacles	Install only				✓		
Trash receptacles						✓	
Entry welcome carpets/walk-off mats				✓			
Exterior and pool storage containers						✓	
Pool guard stands and boxes						✓	
Towel pick-up and return boxes				✓			
Special props, displays, and stands						✓	
Canopies - Metal, glass and all materials	Per plans and spec's.	✓					
Pool deck furniture and accessories				✓			
Portable furniture (exterior patio dining)	Per FFE specifications			✓			
Restaurant dining ornamental fence enclosure and gates	Per plans and specifications	✓					
Exterior card locks including pool gates			✓				

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Bike racks		✓					
Guestrooms and Suites							
Dresser draw and TV stand	FF&E			✓			
Desk and desk chair	FF&E			✓			
Wardrobe closet millwork unit	FF&E			✓			
Guestroom built-in soffit & downlights over headboard		✓					
Guestroom entry door, frame and hardware		✓					
Guestroom locking system (key card access)			✓				
Bathroom doors (and hardware)		✓					
Guestroom connecting doors and hardware		✓					
Suite Interior bedroom doors and hardware		✓					
Vanity Mirror - hardwired at the Courtyard Guestbaths	FFE - Elec hook-up by GC			✓			
Window treatment	FFE			✓			
Bath and entry floor tile and bath wall tile		✓					
Step-in-shower with curb and seat	ADA guestbaths only	✓					
Marble thresholds at Bath Entry		✓					
Bath vanity countertops			✓				
Vanity Sink and Faucet	Material by Plumbing per spec	✓					
Vanity blocking and ledgers for mounting	Millwork	✓					
Shower faucet, head, and trim		✓					
Shower enclosure - Glass, door and frame	Per plans and Spec's	✓					
Bath/Shower faucet and trim		✓					
Water Closets - Guestrooms		✓					
Bath Tubs - Guestrooms		✓					
Guestroom kitchen cabinets and counters		✓					
Guest suite kitchen accessories						✓	
Refrigerators and Residential Appliances	Mini-fridge at CY is OFOI		✓				
Carpet			✓				
Carpet Pad			✓				
Vinyl flooring		✓					
Vinyl Wall Covering - All Walls			✓				
Wall Prep		✓					
Residence Inn Vanity Decorative Mirror				✓			
Residence Inn Vanity - Free standing			✓				
Residence Inn Vanity - Decorative Side Panel & Trim			✓				
Residence Inn Vanity In-Wall Shelves (Cubbies)			✓				
Residence Inn Closet Shelf and Hanging Rod	Within Armoire - FF&E			✓			
Courtyard Closet Shelf and Hanging Rod		✓					
Toilet accessories		✓					
Towel Bars and Shelf		✓					
Shower Curtain Rods at Tubs		✓					
Grab Bars		✓					
Tub & shower seat	ADA only	✓					

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Grab Bars in tub area		✓					
Robe Hooks		✓					
Guest closet In-wall room safes						✓	
Hair Dryers						✓	
Residence Inn Iron and Ironing Board (Wall Mount)	Within Armoire					✓	
Courtyard Iron and Ironing Board (Wall Mount)	In closet					✓	
Wardrobe Mirrors within Armoire	Within Armoire			✓			
Evacuation Maps / Rate Card Frames				✓			
Light Fixtures: Down lights		✓					
Light Fixtures: Vanity Sconce			✓				
Light Fixtures: Ceiling lights			✓				
Wiring for Floor, Table Lamps, and Plug-in	Wiring & Trim by GC	✓					
CATV/Data/Telephone Cabling/trim		✓					
Illuminated Light Switches at Entry		✓					
Custom Light Fixtures	Surface Mounted		✓				
HVAC Grilles and Exhaust		✓					
HVAC unit	Four-pipe system unit	✓					
Thermostat for coil unit	Remote Mounted as indicated	✓					
Artwork, Framed Pictures and Graphics	FF&E			✓			
Wood base at floor		✓					
Built-in Valances for Draperies		✓					
Drywall Soffits (Entry, kitchen headboard & bathroom)	Refer to guest room plans	✓					
Backing/Blocking for all items including FF&E	Coordinate w/ ID Drwgs & FFE	✓					
Backing for Millwork and Wall Mounted Items		✓					
Corner Guards in Guestrooms		✓					
Clock Radio/CD Player/Alarm Clock						✓	
Telephone outlets (Including Phone in Bath)	Bath Phone in ADA Rms only	✓					
Beds and Headboards				✓			
Night Stands				✓			
Wardrobe Storage closet (Armoire)				✓			
Chairs and Tables in Sitting Area				✓			
Desk Chair				✓			
Couch in Sitting Areas				✓			
Plasma/Flat screen Televisions				✓			
Swivel mount TV bracket for Plasma/Flat Screen TV's				✓			
Floor and table lamps				✓			
Portable luggage racks						✓	
Casegoods and storage containers				✓			
Bed, mattress and box springs				✓			
Bed pillows, sheets, blankets, soft goods						✓	
Linens and towels for Bath						✓	
Hardware for draperies				✓			
Shower curtain liner, and hooks (Tubs & ADA Only)						✓	
Shower Curtain over-drape (Tubs & ADA Only)						✓	

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Incidentals: trash can, ice bucket, glasses, etc.						✓	
Residence Inn Guestroom Entry "Shed-the-Day" counter		✓					
Corridors and Lobbies							
Corridor Carpet			✓				
Courtyard Corridor Carpet base			✓				
Wood, Rubber or Vinyl Base		✓					
Corridor Vinyl Wall Covering			✓				
Elevator Lobby Floor Tile and Wood Base	Wood Base Millwork	✓					
Elevator Lobby Upgraded Wall Finish		✓					
Corner Guard Protection in Corridors		✓					
Chair Rail or Wall Protection		✓					
Ice Machines	MEP Hook-ups by GC					✓	
Shelf for housekeeping storage		✓					
Doors at Stairs, Electrical, Service Lobby		✓					
Doors at Elevator Lobby Pairs		✓					
Directional Signs				✓			
Room Identification Sign				✓			
Fire Extinguisher Cabinets		✓					
Portable metal storage shelving (housekeeping, linens)						✓	
Backing/Blocking for all items including FF&E	Coordinate w/ ID Drwgs & FFE	✓					
Public Area - Meeting Rooms							
Built-in furniture: counters, cabinets, shelving		✓					
Built-in display cases, cabinets, shelving		✓					
Wall preparation and wall covering installation		✓					
Operable Partitions in meeting rooms		✓					
Chalk and tack boards and related specialties						✓	
Hardware and blocking required for meeting spaces		✓					
Dimming systems and lighting (controls)		✓					
Doors and frames		✓					
Acoustical wall panels and coverings		✓					
Architectural hardware for doors		✓					
Wall, floor, base, ceiling finishes		✓					
Drywall beam encasements and soffits		✓					
Code Signage (required)		✓					
A/V System	Cable, trays, boxes & speakers by GC			✓			
Queuing posts and movable protective bollards						✓	
Speaker podiums (incl. portable sound system)						✓	
Televisions, monitors (including brackets)	Backing and wall prep by GC			✓			
Portable stages, steps, dance floors						✓	
Chairs and tables for meeting rooms						✓	
Banners, murals and wall hangings	Backing and wall prep by GC			✓			

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Decorative framed mirrors	Support and backing by GC			✓			
Draperied and other window treatment	Support and backing by GC			✓			
Artwork, artifacts, and logo art				✓			
Point-of-Sale (POS) equipment	Conduit and wiring by GC					✓	
Carpeting and pad	Install by GC		✓				
Interior landscaping pots and containers				✓			
Interior landscaping plants						✓	
Public phones	Power/Data/Telephone by GC			✓			
Area rugs and custom carpets				✓			
Ash urns and entries and lobby				✓			
Custom light fixtures, chandeliers, wall sconces	Power, Controls, Trim & Backing by GC		✓				
Meeting Room furniture, tables and chairs	Furniture install only			✓			
Vinyl wall covering	Wall prep and install by GC		✓				
Covering for operable and moving partitions		✓					
Meeting / Conference table and furniture				✓			
Backing/Blocking for all items including FF&E	Coordinate w/ ID Drwgs & FFE	✓					
Public Area							
Perimeter drywall partitions, drywall and fire tape		✓					
Decorative plaster		✓					
Brick veneer		✓					
Doors and frames		✓					
Plumbing fixtures, sinks, drains, and trim		✓					
Public toilet fixtures, trim and sinks		✓					
Built-in custom millwork and cabinets		✓					
Built-in displays, cabinets, custom shelving		✓					
Ceiling and soffit details throughout		✓					
Decorative window treatments and coverings				✓			
Wall preparation and wall covering installation		✓					
Public toilet vanities, partitions, mirrors		✓					
Built-in valances and curtain pockets for windows		✓					
Dimming systems and lighting controls		✓					
Bars, back bar cabinets, bar equipment and counters	Including bar countertop	✓					
Wall, floor, base, ceiling finishes:		✓					
Specialty surface mtd. lighting for artwork, graphics, etc.	Rough electrical and trim only		✓				
Special decorative ceiling treatments		✓					
Fire Life Safety equipment and exit signs		✓					
Code required Signage		✓					
A/V System	Cable, boxes & speakers by GC			✓			
Built-in two-sided Fireplace and Flue	Support by GC	✓					
Fireplace screens, fire stones		✓					
Banquette seating at restaurant and bars				✓			
Televisions, monitors (in restaurants and bars)				✓			

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Chairs and tables for breakfast area/lobby/bar	FF&E			✓			
Bar tables fixed and portable	FF&E			✓			
Restaurant dining tables and chairs	FF&E			✓			
Banners, murals and wall hangings	FF&E			✓			
Decorative framed mirrors	FF&E			✓			
Artwork, artifacts, and logo art	FF&E			✓			
Point-of-Sale (POS) equipment	Conduit and Cabling by GC			✓			
Carpeting and pad (material by owner)	Install by GC		✓				
Area rugs				✓			
Custom light fixtures, chandeliers, wall sconces			✓				
Vinyl wall covering	Wall prep by GC		✓				
Sneeze guards	Refer to food service drawings	✓					
Backing/Blocking for all items including FF&E	Coordinate w/ ID Drwgs & FFE	✓					
<u>Public Area - Guest Services</u>							
Built-in furniture: counters, cabinets, shelving		✓					
Built-in fitness cabinets, shelving	Refer to ID Drawings.	✓					
Built-in displays, cabinets, custom shelving		✓					
Wall preparation and wall covering installation		✓					
Toilet fixtures & trim: vanity, partition, mirror	Refer to ID Drawings.	✓					
Chalk and tack boards and related specialties		✓					
Backing/Blocking for all items including FF&E	Coordinate w/ ID Drwgs & FFE	✓					
Pool and pool shower		✓					
Pool accessories and all code related equipment		✓					
Doors, frames, thresholds and all hardware		✓					
Architectural hardware for doors		✓					
Wall, floor, base, ceiling finishes		✓					
Special decorative ceilings and drywall		✓					
Code required Signage		✓					
A/V system	Cable, boxes & speakers by GC	✓					
Televisions, monitors (in public areas)	Rough-in and brackets by GC			✓			
Portable fitness equipment					✓		
Specialty equipment: cash registers, time clock, monitors						✓	
Linens and towels						✓	
Chairs and tables for guest services						✓	
Merchandise display fixtures, racks (non-custom shelving)		✓					
Recreation equipment						✓	
Banners, murals and wall hangings				✓			
Decorative framed mirrors				✓			
Glass Mirror walls for fitness		✓					
Draperies and other window treatment				✓			
Point-of-Sale (POS) equipment	Cabling and Conduit by GC	✓				✓	
Carpeting & pad material only	Install by GC		✓				

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Tile and stone finishes	Including Raised tile system at pool deck	✓					
Custom light fixtures, chandeliers, wall sconces			✓				
Vinyl wall covering (material by owner)	Wall prep and install by GC		✓				
Pool deck and shell waterproofing/drainage		✓					
Elevated pedestal paver system at pool deck		✓					
Guest Laundry Washers & Dryers	Hook-up and Venting by GC					✓	
Public Area - Main Lobby							
Decorative ceiling treatments and detailing		✓					
Perimeter drywall partitions, drywall and fire tape		✓					
Decorative plaster		✓					
Brick veneer		✓					
Main reception desk and check-in areas		✓					
Concierge desk and check-in millwork		✓					
Bellman and luggage storage desk and millwork		✓					
Built-in furniture: counters, cabinets, shelving		✓					
Built-in displays, cabinets, custom shelving		✓					
Public toilet rooms and fixtures, sinks, vanities, mirrors	Coordinate size and placement of mirrors with ID package	✓					
Blocking and backing for artwork	Coordinate w/ ID Drwgs & FFE	✓					
Built-in valances and curtain pockets for windows	where occurs	✓					
Light Fixtures and dimming system / lighting controls		✓					
Lobby area furniture, chairs, and seating				✓			
Lounge area seating and furniture				✓			
Wall, floor, base, ceiling finishes		✓					
Millwork including registration, bell desk, concierge, valet		✓					
Front desk motion detector		✓					
Reception Desk Pods and built-in millwork		✓					
Bell stand call system and phone (incl. wiring, cabling & trim)		✓					
Retail market millwork and built-ins (Grab and Go)		✓					
Specialty lighting for artwork, graphics, etc.	Wire, conduit & trim by GC		✓				
Acoustical wall panels and coverings		✓					
Ceiling hang points and supports for artwork		✓					
Framed and glass enclosed logo art				✓			
Code required and directional Signage	Part of overall sign package			✓			
A/V system	Cable, boxes & speakers by GC			✓			
Built-in Fireplace and Flue/Power-Vent		✓					
Fireplace screens, fire stones		✓					
Banquette seating at lounge and waiting areas				✓			
Queuing posts and movable protective bollards						✓	
Televisions, monitors (in public areas and guest rooms)	Wire, cable, boxes & trim by GC			✓			

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Specialty equipment: cash registers, time clock, monitors						✓	
Luggage carts						✓	
Portable stages, steps, dance floors						✓	
Merchandise display fixtures, racks (non-custom shelving)			✓				
Banners, murals and wall hangings				✓			
Decorative framed mirrors				✓			
Draperied and other window treatment				✓			
Specialty wall finishes/treatment	Refer to ID Documents	✓					
Artwork, artifacts, and logo art				✓			
Point-of-Sale (POS) equipment	Wire, Conduit, Rough-in & Trim by GC					✓	
Carpeting & Pad material			✓				
Interior landscaping pots & containers				✓			
Interior landscaping plants						✓	
Public phones	Rough-in & Trim by GC					✓	
ATM machines	Power, data & trim by GC					✓	
Hotel directories and signage program	Signage allowance			✓			
Area rugs				✓			
Custom light fixtures, chandeliers, wall sconces			✓				
Vinyl wall covering	Wall prep and install by GC		✓				
Lobby safe deposit boxes		✓					
Merchandise safe		✓					
Backing/Blocking for all items including FF&E	Coordinate w/ ID Drwgs & FFE	✓					
Wood Paneling	Refer to ID Documents	✓					
<u>Back-Of-House</u>							
Built-in millwork cabinets and counters		✓					
Fixed storage shelving: linen house keeping, storage	Portable shelves by owner	✓					
Wall, floor, base, ceiling finishes: (no carpet/wall covering)		✓					
Wall preparation & adhesives for vinyl wall covering		✓					
Entry card readers	Wire, conduit, cable & trim by GC		✓				
Entry key card system				✓			
Cameras and security monitoring	Wire, conduit, cable, trim by GC			✓			
Back-of-house drinking fountains		✓					
Metal Lockers at employee facilities		✓					
Benches for locker rooms and showers		✓					
Stainless/plastic corner guards and wall guards		✓					
Fixtures, trim & accessories in employees lockers & toilets		✓					
Cabinets, counters, shelves for laundry		✓					

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Linen and trash chutes and access doors		✓					
Key registry, key cabinet, duplicates and blanks	Per Specifications	✓					
Stainless steel and porcelain hand sinks	Refer to food service plans	✓					
Wall guard protection in corridors		✓					
Janitor closet mop rack and sink		✓					
Safety eye wash/shower		✓					
Televisions shelf and brackets	Wire, conduit, cable & trim by GC			✓			
Luggage storage shelving		✓					
Recycle storage containers						✓	
Laundry equipment: washers and dryers	Structural platform, enclosures, utilities and MEP hook-ups (venting, power/disconnects, gas interlock/disconnect, domestics water, sewer, and trench drains/grates) by GC					✓	
Laundry dryer lint trap	MEP hook-ups and vents by GC					✓	
Laundry work table						✓	
Trash Compactor	MEP Hook-ups by GC			✓			
Wardrobe ironers						✓	
First aid cabinets						✓	
Housekeeping equipment: vacuums and supplies						✓	
Work tables in housekeeping & guest laundry						✓	
Equipment for work shops: benches, tools, racks						✓	
Portable furniture and files						✓	
Time clock	Power and data by GC					✓	
Vending machines (employee dining)						✓	
Garment bags for wardrobe conveyor						✓	
Break room furniture				✓			
Portable metal storage shelving (on wheels)						✓	
Furniture and demountable partitions				✓			
Chalkboards and bulletin boards						✓	
Cash control supplies and small equipment						✓	
Portable carts (linens housekeeping, etc.)						✓	
Pallet racks						✓	
Carpeting (double stick)	Install by GC		✓				
Residential Appliances			✓				
Administration and Office							
Office built-in millwork and cabinets		✓					
Storage shelving	Portable shelving by owner	✓					
Wall, floor, base & ceiling finishes: (excl. carpet/wall covering)		✓					

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Cash control: vault, drop safe, receiver door	Conduit and cabling by GC					✓	
Electrical wiring and outlets for equipment	Includes power/data/telephone	✓					
Wall preparation & adhesives for vinyl wall covering		✓					
Safe key cabinet		✓					
Guest safe deposit boxes		✓					
Cashier office safe				✓			
Built-in counters shelving		✓					
Reservations system						✓	
Portable furniture and files				✓			
Photocopiers, fax machines, other	Power/data/telephone by GC					✓	
Executive office furniture				✓			
First-aid kits, oxygen tanks, wheelchairs, water coolers						✓	
Office equipment and supplies						✓	
Small office machines						✓	
Tack boards and Bulletin boards						✓	
Computers and printers (incl. Software)						✓	
Portable AV equipment						✓	
Clocks and wall mount equipment						✓	
Carpeting (double stick)	Install by GC		✓				
Vinyl wall covering	Wall finish and install by GC		✓				
Office window treatments, blinds, shades	Backing/Blocking by GC			✓			
<u>Food Service, Buffet line and Kitchen</u>							
Custom fabricated stainless steel counters, shelving	all millwork	✓					
Built-in millwork, cabinets, counters - standard		✓					
Electric supply and home runs for kitchen equipment		✓					
Finishes: floor, base, wall and ceiling finishes	Per finish schedule	✓					
Floor tile in walk-ins boxes		✓					
Doors, frames, thresholds (except walk-in box doors)		✓					
Blocking and support for hoods and display counters		✓					
Duct work and fans for exhaust hoods		✓					
Stainless corner and wall guards including service areas	Stainless steel in kitchens	✓					
Hand sinks including soap and towel dispensers		✓					
Floor drains, troughs, and gratings		✓					
Special fabricated food service equipment		✓					
Kitchen equipment	Hard wired & Plumbing	✓					
Walk-in cooler & freezer boxes (incl. refrigeration system)		✓					
Storage shelves		✓					
Walk-in cooler storage shelving (on wheels)		✓					
Exhaust hoods over cooking lines	Including rated shafts and wrap	✓					
Exhaust hood fire protection	Ansol or equal	✓					
Beverage dispensing system	MEP Hook-ups by GC					✓	
Insulated conduit PVC for refrigeration lines (walk-ins)	Rough-in - need vendor	✓					

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Insulated conduit for beer line from cooler to bar		✓					
Insulated floors for walk-in freezers		✓					
Cooking vessels: microwaves, mixers, heaters, toasters		✓					
Storage containers (portable)						✓	
Portable bars						✓	
Portable carts: service, mini-bar, clean-up, room service						✓	
Portable furniture and files						✓	
Incidental Appliances: blenders, can openers, etc.						✓	
Waste baskets and trash cans						✓	
Storage containers (portable)						✓	
China, flatware, glassware, etc.						✓	
Cooking vessels, utensils, cutting boards, etc.						✓	
Chalk and tack boards						✓	
Mobile hot and cold food carts						✓	
Portable metal storage shelving (on wheels)						✓	
Soap and towels dispensers at hand sinks		✓					
Trash Compactor and Dumpsters	Conduit and rough-in by GC					✓	
Sneeze guard		✓					
<u>Building and Support Systems</u>							
Hotel security equipment: CCTV, cameras, alarms, monitors	Wire, trays, conduit, trim & racks by GC					✓	
Guestroom CATV/Data/Telephone cabling		✓					
Life safety system equipment: built-ins, alarm, wiring		✓					
Digital Dimming and lighting control system		✓					
A/V System	Wire, trays, conduit, trim & racks by GC	✓				✓	
Televisions	Backing by GC					✓	
Telephone system equipment and installation	Phones, handsets, networks					✓	
CATV system	Wire, conduit, cable, boxes, trays by GC					✓	
IDF and Tele-Data equipment rooms and back boards		✓					
PMS equipment including cable, connections	Wire, trays, conduit, trim & racks by GC			✓			
POS equipment including cable, connections	Wire, trays, conduit, trim & racks by GC			✓			
Interior building signage & graphics for public areas	Signage & graphics allowance			✓			
Guest Entry key card systems and equipment	GC responsible for remote transformers, low voltage wiring/power, conduit, cable, boxes, trays for all wall mounted card reader stations		✓				
Elevator card readers		✓					
Ving head-in equipment				✓			
Emergency Generator and ATS switch		✓					
Temporary improvements to maintain existing operations		✓					

Item Description	Notes and Clarifications	Owner/Hotel Operator (FF&E)			OS&E		Allowance
		CFCI	OFCI	OFOI	OFCI	OFOI	
Fire protection equipment: extinguishers, sprinklers, alarms		✓					
Two-way communication equipment, radios	Ops; not fire dept.					✓	
Computer system including cable	Data conduit rough-in by GC					✓	
Portable AV equipment and installation						✓	
Firefighters oxygen fill stations		✓					
Firefighters communication system		✓					
Elevators		✓					
Other Items							
Attic Stock (materials in Category 2)		✓					
Utilities until Certificate of Occupancy			✓				
Re-keying of building after construction						✓	
Temporary signage for guests	Code signage for FLS by GC					✓	
Printed graphics including design fees						✓	
Off-site services & allocations: central laundry, food						✓	
Transportation locations, stations, stops, stands						✓	
Employee transportation vehicles						✓	
Fuel oil fill stations		✓					
Light bulbs for architectural lighting		✓					
Light bulbs for decorative lighting					✓		
Spare light bulbs and tubes for fixtures	10% stock of each type					✓	
Attic stock for Category 5, i.e. TV's						✓	
Non-public area graphics and signage	Signage & graphics allowance					✓	
Building site security after Certificate of Occupancy						✓	
Warehouse receiving and storage of materials						✓	
Decorative Memorabilia and Artwork						✓	

- SECTION 01 1150 -**ELECTRONIC DRAWINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The Architect-Engineer, if requested, will provide the General Contractor with a one time electronic copy of the Contract Document Drawings limited to Plan sheets and Exterior Building Elevations for distribution to subcontractors and suppliers for a fee per sheet for the preparation of Shop Drawings and Site Work. Subsequent requests will be issued for the same fee (see sample of form and fee schedule). Release of other sheets will be at the sole discretion of the Architect.
 - 1. The Architect nor its' consultants assume any liability for such usage of these electronic files.
 - 2. Requests for additional sheets shall be billed in advance at \$200.00 per sheet. Company checks or cashiers checks shall be made payable to:
 - a. (ACRM) Awbrey Cook Rogers McGill Architects, 1045 14th. Street, San Diego, CA 92101
- B. The electronic copy will be provided via electronic file transfer in AutoCad 2004 format, or later.

1.3 REFERENCES

- A. A copy of the Agreement is included at the end of this Section.

PART 2 - PRODUCTS - (NOT APPLICABLE)**PART 3 - EXECUTION****3.1 EXECUTION**

- A. Contractor shall provide signed agreement along with payment in full to the Architect prior to receiving delivery of the electronic drawing files.

- END OF SECTION -

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**AN AGREEMENT BETWEEN ARCHITECT-ENGINEER OF RECORD AND CONTRACTOR
FOR TRANSFER OF COMPUTER AIDED DRAFTING (CAD) FILES ON ELECTRONIC MEDIA**Architect-Engineer of Record (ACRM) Awbrey Cook Rogers McGill Architects

Contractor _____

Address: _____

Date: _____

Project Name: _____

Location: _____

The AER will provide the following CAD files, dated _____, for the convenience of
the contractor in preparing shop fabrication drawings:

Drawings were prepared on the following:

Computer Software: AUTOCAD Version: Rel2004

Contractor shall pay ACRM a service fee of two hundred dollars (\$ 200.00) per sheet for a one
time electronic copy of the Contract Document Drawings limited to Plan sheets and Exterior
Building Elevations. ACRM shall be paid the same fee for subsequent requests. Sheets will be
released at the sole discretion of the ACRM.

TERMS AND CONDITIONS:

1. ACRM makes no representation as to the compatibility of the CAD files with any hardware or software.
2. Since the information set forth on the CAD files can be modified unintentionally or otherwise, the ACRM reserves the right to remove all indicia of its ownership and/or involvement from each electronic display. This media should not be considered a certified document.

All information on the CAD files is considered instruments of service of the ACRM and shall not be used for other projects, for additions to this project, or completion of this project by others. CAD files shall remain the property of the ACRM, and in no case shall the transfer of these files be considered a sale.

4. AER makes no representation regarding the accuracy, completeness, or permanence of CAD files, or for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the CAD files may not have been incorporated. In the event of a conflict between the ACRM's sealed Contract Drawings and CAD files, the sealed Contract Drawings shall govern. It is the Contractor's responsibility to determine if any conflicts exist. The CAD files shall not be considered to be Contract Documents as defined by the General Provisions of the Contract for Construction.
5. The use of CAD files prepared by the ACRM shall not in any way obviate the Contractor's responsibility for the proper checking and coordination of dimensions, details, member sizes and gage, and quantities of materials as required to facilitate complete and accurate fabrication and erection.
6. The Contractor shall, to the fullest extent permitted by law, indemnify, defend and hold harmless the ACRM, and its sub-consultants from all claims, damages, losses, expenses, penalties and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of the CAD files by the Contractor, or by third party recipients of the CAD files from the Contractor.
7. The ACRM believes that no licensing or copyright fees are due to others on account of the transfer of the CAD files, but to the extent any are, the Contractor will pay the appropriate fees and hold the ACRM harmless from such claims.
8. Any purchase order number provided by the Contractor is for Contractor's accounting purposes only. Purchase order terms and conditions are void and are not a part of this Agreement.
9. Payment of the service fee is due upon receipt of the CAD files.
10. This Agreement shall be governed by the laws of the principal place of business of the ACRM.

AUTHORIZED ACCEPTANCE

by Architect-Engineer
of Record

by Contractor

Signature

Signature

Print Name and Title

Print Name and Title

Date

Date

ELECTRONIC DRAWINGS

- SECTION 01 2500 -**SUBSTITUTION PROCEDURES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Special Provisions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for proposed product substitutions.

1.3 RELATED REQUIREMENTS

- A. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
- B. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.4 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.5 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use facsimile of form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

- b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.6 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

SUBSTITUTION PROCEDURES

1.7 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

- d. Requested substitution provides sustainable design characteristics that specified product provided for achieving sustainable prerequisites and credits.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

-

MATERIALS OR PRODUCT SUBSTITUTION REQUEST -

To: _____ Project: _____

Specified Item: _____

Section No.: _____ Page No. _____ Paragraph No. _____

Description: _____

Reason for Request: ☐ Substitution for Cause, or ☐ Substitution for ConvenienceThe undersigned requests consideration of the following **Proposed Substitution**: _____

The attached data include product description, specifications, drawings, photographs, performance and test data required for evaluation of request; applicable portions of data are clearly identified.

Additionally, attached data include a description a description of changes to Contract Documents which proposed substitution will require for its proper installation. The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, as fully documented with this request.

Submitted by:

Signature: _____

Contractor: _____

Address: _____

Date: _____ Phone # _____

Attachments: _____

For Use by Architect:

☐ Returned Without Action.☐ Accepted. ☐ Not Accepted.☐ Accepted as noted. ☐ Received too late.

By: _____

Date: _____

Remarks: _____

- SECTION 01 2600 -**CONTRACT MODIFICATION PROCEDURES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 RELATED REQUIREMENTS:

- A. Section 01 2500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.4 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on form provided by the Architect.

1.5 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Always retain first subparagraph below. Only a Change Order or a Construction Change Directive authorizes Contractor to proceed with a proposed change.
 - 2. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 3. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

- c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms provided by Owner. Sample copies are included in Project Manual.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use form provided by Owner. Sample copy is included in Project Manual.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on form provided by the Architect. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

CONTRACT MODIFICATION PROCEDURES

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

3.1 FORMS

- A. Attached to the end of this Section are the following forms for the Contractors use.
 - 1. Cost Breakdown for Contractor's Price Proposal form.

SAMPLE ONLY

COST BREAKDOWN FORM FOR CONTRACT MODIFICATION

One separate form shall be used by Contractor, each first tier subcontractor and each lower tier subcontractor. One form for each shall be used for each change order. One form for each, for each day shall be used for Force-Account work.

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COST BREAKDOWN FOR CONTRACTOR PRICE PROPOSAL

SHEET 1 OF 3

GENERAL CONTRACTOR FORM

PROJECT NUMBER: _____

PROJECT NAME: _____

CONTRACTOR : _____

CHANGE ORDER NUMBER : _____ DATE: _____

CHANGE ORDER DESCRIPTION:

SUMMARY OF TOTAL COSTS					
1. TOTAL LABOR COSTS		\$	-		
2. Ten percent (10%) of Line 1		\$	-		
3. Sum of Lines 1 & 2			\$	-	
4. TOTAL MATERIAL COSTS		\$	-		
5. Ten percent (10%) of Line 4		\$	-		
6. Sum of Lines 5 & 6			\$	-	
7. TOTAL EQUIPMENT RENTAL COSTS		\$	-		
8. Ten percent (10%) of line 7		\$	-		
9. Sum of lines 7 & 8			\$	-	
10. TOTAL OF SUBCONTRACTED COST		\$	-		
11. Five percent (5%) of line 10		\$	-		
12. Sum of Lines 10 & 11			\$	-	
SUBTOTAL OF DIRECT COSTS & MARK-UP				\$	-
COST OF BONDS				\$	-
TOTAL OF CONTRACT MODIFICATION				\$	-

CONTRACT MODIFICATION PROCEDURES

PROJECT NAME
PROJECT LOCATION

SHEET 2 OF 3

CHANGE ORDER DESCRIPTION: _____

EQUIPMENT				
SIZE AND TYPE	I.D. #	HOURS	RATE	TOTAL
				\$ -
				\$ -
				\$ -
				\$ -
				\$ -
TOTAL EQUIPMENT RENTAL COSTS (Transfers to Line 7 of Sheet 1)				\$ -

PROJECT NAME
PROJECT LOCATION

PROJECT NO. 0000.00

COST BREAKDOWN FORM FOR CONTRACT MODIFICATION

SHEET 3 OF 3

CHANGE ORDER NUMBER : _____ DATE: _____

CHANGE ORDER DESCRIPTION: _____

SUBCONTRACTED WORK		
SUBCONTRACTOR	DESCRIPTION OF WORK SUBCONTRACTED	COST
TOTAL COST OF SUBCONTRACTED WORK (Transfers to Line 10 of Sheet 1)		\$ -

CONTRACTOR: _____ Date: _____

VERIFIED BY INSPECTOR: _____ Date: _____

CONTRACTOR OR AUTHORIZED REPRESENTATIVE: _____

APPROVED BY INSPECTOR: _____

- END OF SECTION -

- SECTION 01 2900 -**PAYMENT PROCEDURES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 RELATED REQUIREMENTS:

- A. Section 01 2600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
- B. Section 01 3200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.4 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.5 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments; provide subschedules showing values coordinated with each phase of payment.
 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work; provide subschedules showing values coordinated with each element.
 5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Section 01 1100 "Summary."
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for final project documentation, including LEED or other sustainable initiatives as specified in related sections, and other Project closeout requirements in an amount totaling seven percent of the Contract Sum and subcontract amount.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract.
 - a. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.6 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
 1. Review of draft copy of Application for Payment is a typical practice. Retain subparagraph below with paragraph retained above if required.
 2. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 or other forms acceptable to the Owner as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

- E. **Stored Materials:** Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. **Transmittal:** Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. **Waivers of Mechanic's Lien:** With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. **Waiver Forms:** Submit executed waivers of lien on forms acceptable to Owner.
- H. **Waivers of Mechanic's Lien:** With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or proceeded by conditional final waivers from every entity involved with performance of the Work covered by the application that is lawfully entitled to a lien.
 5. **Waiver Forms:** Submit executed waivers of lien on forms, acceptable to Owner.

- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Schedule of unit prices.
 7. Submittal schedule (preliminary if not final).
 8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of building permits.
 11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 12. Initial progress report.
 13. Report of preconstruction conference.
 14. Certificates of insurance and insurance policies.
 15. Performance and payment bonds.
 16. Data needed to acquire Owner's insurance.

- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing **100 percent** completion for portion of the Work claimed as substantially complete.
 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

- SECTION 01 3100 -**PROJECT MANAGEMENT & COORDINATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
1. General coordination procedures.
 2. Coordination drawings.
 3. Requests for Information (RFIs).
 4. Project meetings.
- B. Related Requirements:
1. Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
 2. Section 01 3200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 3. Section 01 7300 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 4. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.
 5. Section 01 9113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.

2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of

- visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 3300 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Preparation Format: DWG, Version , operating in Microsoft Windows operating system.
 3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and Portable Data File (PDF) format.

4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files as specified in related Section 01 1150 "Electronic Drawings"
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in AutoCAD Format.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual or an Agreement form acceptable to Owner and Architect.

1.7 REQUESTS FOR INFORMATION (RFIS)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Form bound in Project Manual or a Software-generated form with substantially the same content as indicated above, acceptable to Architect.
 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

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- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Sustainable design requirements.
 - m. Preparation of record documents.
 - n. Use of the premises.
 - o. Work restrictions.
 - p. Working hours.
 - q. Owner's occupancy requirements.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for moisture and mold control.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and

- installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Commissioning Authority of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the

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meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for completing sustainable design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Coordination of separate contracts.
 - l. Owner's partial occupancy requirements.
 - m. Installation of Owner's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.

- 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of proposal requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

3.1 FORMS

- A. Attached to the end of this Section are the following forms for the Contractors use.
 1. Request For Information form.

- END OF SECTION -

-

REQUEST FOR INFORMATION

RFI #: _____

DATE: _____

COST IMPACT Y / N (Circle One)

Project: _____

DWG REF: _____

SUBJECT: _____

SPEC REF: _____

QUESTION:

RESPONSE NEEDED BY: _____

SUGGESTED SOLUTION:

SIGNATURE: _____ DATE: _____

ANSWER:

SIGNATURE: _____ DATE: _____

- SECTION 01 3200 -**CONSTRUCTION PROGRESS DOCUMENTATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Special reports.

1.3 RELATED REQUIREMENTS:

- A. Section 01 3233 "Construction Progress Documentation"
- B. Section 01 3300 "Submittal Procedures" for submitting schedules and reports.
- C. Section 01 4000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.4 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.

- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner .
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.5 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
 - 3. Two paper copies.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

CONSTRUCTION PROGRESS DOCUMENTATION

- 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
 - G. Daily Construction Reports: Submit at monthly intervals.
 - H. Material Location Reports: Submit at monthly intervals.
 - I. Site Condition Reports: Submit at time of discovery of differing conditions.
 - J. Special Reports: Submit at time of unusual event.
 - K. Qualification Data: For scheduling consultant.

1.6 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing work stages area separations interim milestones and partial Owner occupancy.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review submittal requirements and procedures.
 - 7. Review time required for review of submittals and re-submittals.
 - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 - 10. Review and finalize list of construction activities to be included in schedule.
 - 11. Review procedures for updating schedule.

1.7 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and re-submittal times indicated in Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 1100 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.

5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 1100 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
1. Temporary enclosure and space conditioning.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 01 2900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

CONSTRUCTION PROGRESS DOCUMENTATION

- C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.
 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 7 percent of the Contract Sum.

- a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
 1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results

or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
 - 1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 - 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

- END OF SECTION -

SECTION 01 3233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Final Completion construction photographs.
 - 3. Periodic construction photographs.

1.3 RELATED SECTIONS INCLUDE THE FOLLOWING

- A. Section 01 3300 "Submittal Procedures" for submitting photographic documentation.
- B. Section 01 7700 "Closeout Procedures" for submitting photographic negatives, digital media and construction videotapes as Project Record Documents at Project closeout.
- C. Section 02 4116 "Structure Demolition"

1.4 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation, if photographer is a professional.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1600 by 1200 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Submit two (2) copies of CD Rom with images dated and with titled labels to Owner plus one copy each to the Architect and Construction Manager.
 - 3. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- C. Preconstruction Photographs: Before starting construction, take color digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Construction Manager (CM).
 - 1. Flag excavation areas and construction limits before taking construction photographs.
 - 2. Take eight photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take twelve photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Final Completion Construction Photographs: Take sixteen (16) color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.
 - 1. Do not include date stamp.
- E. Periodic Construction Photographs: Take 12 color, digital photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Owner's Representative-Directed Construction Photographs: From time to time, Owner's Representative will instruct photographer about number and frequency of color, digital photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

- END OF SECTION -

- SECTION 01 3300 -**SUBMITTAL PROCEDURES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 RELATED REQUIREMENTS:

- A. Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
- B. Section 01 1150 "Electronic Drawings".
- C. Section 01 2900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
- D. Section 01 3200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
- E. Section 01 7823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
- F. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
- G. Section 01 7900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.4 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.5 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. If a startup construction schedule is not required, delete "Initial Submittal" Subparagraph below or revise to require initial submittal within 14 days of date established for commencement of the Work.
 - 3. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 4. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 5. Format: Arrange the following information in a tabular format:
 - a. Add information, such as scheduled dates for purchasing and installation and the activity or event number, if using a CPM construction schedule.
 - b. Scheduled date for first submittal.
 - c. Specification Section number and title.
 - d. Submittal category: Action; informational.
 - e. Name of subcontractor.
 - f. Description of the Work covered.
 - g. Scheduled date for Architect's final release or approval.
 - h. Scheduled date of fabrication.
 - i. Retain three subparagraphs below if CPM construction schedules are required.
 - j. Scheduled dates for purchasing.
 - k. Scheduled dates for installation.
 - l. Activity or event number.

SUBMITTAL PROCEDURES

1.6 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals as specified in Section 01 1150 "Electronic Drawings".
1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD.
 - c. Refer to Section 01 1150 "Electronic Drawings".
 - d. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.
 - e. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.
 - 3) Other files as appropriate to the work.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 –inches by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Name of subcontractor.
 - f. Name of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Use form acceptable to the Architect.
 - b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Architect.
 - 6) Name of Contractor.
 - 7) Name of firm or entity that prepared submittal.
 - 8) Names of subcontractor, manufacturer, and supplier.
 - 9) Category and type of submittal.
 - 10) Submittal purpose and description.
 - 11) Specification Section number and title.
 - 12) Specification paragraph number or drawing designation and generic name for each of multiple items.

SUBMITTAL PROCEDURES

- 13) Drawing number and detail references, as appropriate.
- 14) Indication of full or partial submittal.
- 15) Transmittal number.
- 16) Submittal and transmittal distribution record.
- 17) Remarks.
- 18) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or other electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.

- c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Project Web site or Architect's FTP site specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 3. Action Submittals: Submit number of paper copies of each submittal required for Contractor's use, but not more than seven (7). Architect will retain two copies, Architect's consultants will each retain one copy. Additional copies beyond seven will be discarded by the Architect.
 - 4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
 - 5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

SUBMITTAL PROCEDURES

- a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
 - b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 -inches (215 by 280 mm), but no larger than 30 -inches by 42 inches (750 by 1067 mm).

3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Maximum of seven opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit maximum of seven sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

SUBMITTAL PROCEDURES

- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of

SUBMITTAL PROCEDURES

certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for re-submittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

- END OF SECTION -

- SECTION 01 3316 -**DESIGN-BUILD SUBMITTAL PROCEDURES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes: General requirements for the submittal of plans, details, and calculations for engineered products and systems designated as deferred submittal and/or delegated design / design-build components on the Drawings, and as listed within this Section.
 - 1. To ensure that the specified products are furnished and installed in accordance with the design intent, these procedures have been established for advance submittal of design data, and for review and acceptance or rejection by the Architect.
- B. Contractor is responsible to obtain all regulatory approvals, including obtaining required permits and inspections at no additional cost to the Owner.

1.3 DESIGN-BUILD PRODUCTS & SYSTEMS

- A. Provide design-build submittals as required in the technical sections of the specifications:

1.4 SUBMITTAL PROCEDURES

- A. The number of copies of each type of submittal and distribution procedures shall be determined at the pre-construction conference.
 - 1. Allow sufficient copies for Owner, General Contractor, Architect and Architect's consultants, as applicable.
 - 2. Determine which submittals shall be provided on reproducible material.
- B. Make submittals sufficiently in advance of scheduled dates of installation to provide adequate time for securing necessary approvals, for revision and re-submittal, and for placing orders and securing delivery.
- C. Submit special detailed drawings, schedules, or other data prepared by qualified detailers. Identify details by reference to the Drawing sheet and detail numbers and by Specification Section and article numbers.
- D. Design-build submittals shall meet the requirements for any permit submittals that may be required for construction and shall include not less than the following:

1. Dimensioned plans, elevations, and sections locating assembly components in relationship to each other and in relationship to contiguous building structure or site elements.
 2. Typical and special fabrication and installation details.
 3. Design criteria, drawings and calculations.
 4. Materials and finishes.
- E. Schedule: Submit all design-build submittals within 60 days after Award of Contract.
- F. Do Not Begin Work requiring submittals until the submittals have been returned with the Architect's stamp indicating review and acceptance.

1.5 QUALITY ASSURANCE

- A. Contractor shall be responsible for the design, engineering, fabrication, and installation of design-build items within the physical limitations and design parameters indicated in the Drawings.
1. Submittals of drawings and calculations for structural items shall be wet stamped and signed by a professional Structural Engineer licensed to practice in the state of the Project location.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 APPROVAL PROCEDURES

- A. **Preliminary Submittal:** Submit design data, latest printed product literature, color schedules, samples, and other data to Architect per Section 01 3300 "Submittal Procedures" illustrating intent to meet design and performance requirements.
- B. **Agency Submittal:** Upon acceptance of item by Architect, submit complete calculations and other data to building code agencies for review and approval with transmittal copy to Owner and Architect.
- C. **Final Submittal:** Upon receipt of approval by building code agency, obtain all required permits and submit to Owner.

- END OF SECTION -

- SECTION 01 4000 -**QUALITY REQUIREMENTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. References
 - 2. Quality Assurance
 - a. Testing Laboratory Qualifications
 - b. Control of Installation
 - 3. Tolerances
 - 4. Inspection and Testing Laboratory Services
 - 5. Manufacturers' Field Services and Reports

1.3 RELATED REQUIREMENTS

- A. Information Available to Bidders: Soil investigation data.
- B. General Conditions: Inspections, testing, and approvals required by public authorities.
- C. Section 01 3300 "Submittals and Substitutions": Submission of manufacturers' instructions and certificates.
- D. Section 01 6000 "Material and Equipment": Requirements for material and product quality.
- E. Section 01 7700 "Closeout Procedures"
- F. Individual Specification Sections: Inspections and tests required, and standards for testing.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Architect shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- E. ASTM International Publications:
 - 1. C802 - Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction.
 - 2. C1021 - Practice for Laboratories Engaged in the Testing of Building Sealants.
 - 3. C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
 - 4. C1093 - Practice for Accreditation of Testing Agencies for Unit Masonry.
 - 5. D290 - Recommended Practice for Bituminous Mixing Plant Inspection.
 - 6. D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - 7. D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.
 - 8. E329 - Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
 - 9. E543 - Practice for Determining the Qualification of Nondestructive Testing Agencies.
 - 10. E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.5 SUBMITTALS

- A. Before start of the Work, submit testing firm name, address, and telephone number and names of full time registered Engineers, specialists, and responsible officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.6 QUALITY ASSURANCE

- A. Testing Laboratory Qualifications:
 - 1. Comply with requirements of ASTM Publications C802, C1021, C1077, C1093, D290, D3740, D4561, E329, E543, and E699.
 - 2. Laboratory: Authorized to operate in State in which Project is located.
 - 3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 4. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
- B. Control of Installation:

QUALITY REQUIREMENTS

1. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
2. Comply with manufacturers' instructions, including each step in sequence.
3. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
4. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
5. Perform work by persons qualified to produce workmanship of specified quality.
6. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.7 TOLERANCES

- A. Monitor tolerance control of installed Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from the Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing Products in place.

1.8 INSPECTING AND TESTING LABORATORY SERVICES

- A. Except as otherwise required in the Owner-Contractor Agreement, the Contractor shall appoint, employ, and pay for specified services of an independent firm to perform inspecting and testing, subject to approval of the Owner and Architect.
 1. Note: Reference below is to the Marriott General Conditions for Corporate Projects. Modify subparagraph if a different document is utilized.
 2. Refer to General Conditions, Articles 5 and 26, for additional requirements.
- B. Employment of testing laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. The testing firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Architect .
- D. Inspecting, testing, and source quality control may occur on or off the project site.
- E. Retesting required because of non-conformance to specified requirements shall be performed by the same testing firm on instructions by the Architect .
- F. Laboratory Responsibilities:
 1. Test samples of mixes submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified inspecting, sampling, and testing of Products in accordance with specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or Products.
 6. Perform additional inspection and tests required by the Architect .
 7. Attend preconstruction meetings and progress meetings.
- G. Laboratory Reports: After each inspection and test, promptly submit copies of laboratory report to the Architect and Contractor. Include the following:
1. Date issued
 2. Project title and number
 3. Name of inspector
 4. Date and time of sampling or inspection
 5. Identification of product and specifications section
 6. Location in the Project
 7. Type of inspection or test
 8. Date of test
 9. Results of tests
 10. Conformance with Contract Documents
 11. When requested by Architect , provide interpretation of test results
- H. Limits on Testing Laboratory Authority:
1. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Laboratory may not approve or accept any portion of the Work.
 3. Laboratory may not assume any duties of Contractor.
 4. Laboratory has no authority to stop the Work.
- I. Contractor Responsibilities:
1. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
 2. Cooperate with testing firm and personnel, and provide access to the Work. Furnish samples of materials, design mix, equipment, tools, storage, and assistance by incidental labor as requested.
 3. Provide incidental labor and facilities:
 - a. to provide access to Work to be tested
 - b. to obtain and handle samples at the site or at source of Products to be tested
 - c. to facilitate tests and inspections
 - d. to provide storage and curing of test samples
 4. Notify Architect and testing firm 24 hours prior to expected time for operations requiring services.
 5. Make arrangements with testing firm and pay for additional samples and tests required for Contractor's use.
 6. Notify laboratory sufficiently in advance of cancellation of required testing operations. Contractor shall be responsible to laboratory for changes due to failure to notify if requirements for testing are canceled.

1.9 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and erection as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Submit report in duplicate within 15 days of observation to Architect for information.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION
NOT USED

- END OF SECTION -

_ - SECTION 01 4200 -**REFERENCES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Contract definitions are included in the Conditions of the Contract.
- B. Addenda: Written or graphic instruments issued prior to the opening of Bids, which clarify, correct or change the bidding requirements or the Contract Documents. Addenda shall not include the minutes of the Pre-bid Conference and Site Visit.
- C. Additive Bid: The sum to be added to the Base Bid if the change in scope of work as described in Additive Bid is accepted by Owner.
- D. Agreement: Agreement is the basic contract document that binds the parties to construction Work. Agreement defines relationships and obligations between Owner and Contractor and by reference incorporates Conditions of Contract, Drawings, and Specifications and contains Addenda and all Modifications subsequent to execution of Contract.
- E. Alternate: Work added to or deducted from the Base Bid, if accepted by Owner.
- F. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- G. Approved Equal: Approved in writing by Owner as being of equivalent quality, utility and appearance.
- H. Architect Or Architect/Engineer: The person holding a valid Architect's license, whose firm has been designated as the Architect to provide architectural services on the project.
- I. Bid: The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
- J. Bidder: One who submits a Bid.
- K. By Owner: Work that will be performed by Owner or its agents at the Owner's expense.

REFERENCES

- L. By Others: Work that is outside scope of Work to be performed by Contractor under this Contract, which will be performed by Owner, other contractors, or other means.
- M. Change Order: A written instrument prepared by Architect and signed by Architect, Owner and Contractor, stating their agreement upon all of the following:
 - 1. a change in the Work,
 - 2. the amount of the adjustment in the Contract Sum, if any, and
 - 3. the amount of the adjustment in the Contract Time, if any.
- N. Concealed: Work not exposed to view in the finished Work, including within or behind various construction elements.
- O. Contract Conditions: Conditions of Contract define basic rights, responsibilities and relationships of Contractor and Owner and consists of two parts: General Conditions and Supplementary Conditions.
 - 1. General Conditions are general clauses, which are common to the Owner Contracts.
 - 2. Supplementary conditions modify or supplement General Conditions to meet specific requirements for this Contract.
- P. Contract Documents: Contract Documents shall consist of the documents identified as the Contract Documents in Contract Agreement, plus all changes, addenda and modifications thereto.
- Q. Contract Modification: Either:
 - 1. A written amendment to Contract signed by Contractor and Owner; or
 - 2. A Change Order; or
 - 3. A written directive for a minor change in the Work issued by Architect.
- R. Contract Sum: The sum stated in the Agreement and, including authorized adjustments, the total amount payable by Owner to Contractor for performance of the Work and the Contract Documents. (Also referred to as the Contract Price.)
- S. Contract Times: The number or numbers of days or the dates stated in the Agreement (i) to achieve substantial completion of the Work or designated milestones and/or (ii) to complete the Work so that it is ready for final payment and is accepted.
- T. Contractor: The person or entity identified as such in the Agreement and referred to throughout the Contract Documents as if singular in number and neuter in gender. The term "Contractor" means the Contractor or its authorized representative.
- U. Contractor's Employees: Persons engaged in execution of Work under Contract as direct employees of Contractor, as subcontractors, or as employees of subcontractors.
- V. Date Of Substantial Completion: Date of Substantial Completion of Work or designated portion thereof is date certified by Architect when construction is sufficiently complete in accordance with Contract Documents for Owner to occupy Work or designated portion thereof for its use for which it is intended.
- W. Day: One calendar day, unless the word "day" is specifically modified to the contrary.

REFERENCES

- X. Deductive Bid: The sum to be subtracting to the Base Bid if the change in scope of work as described in Deductive Bid is accepted by Owner.
- Y. Defective: An adjective which, when modifying the word "Work", refers to Work that is unsatisfactory or unsuited for the use intended, faulty, or deficient, that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents (including but not limited to approval of samples and "or equal" items), or has been damaged prior to final payment (unless responsibility for the protection thereof has been assumed by Owner). Architect is the judge of whether Work is defective.
- Z. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- AA. Drawings: The graphic and pictorial portions of Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.
- BB. Engineer: Where referenced in General Conditions, the person holding a valid Engineer's license, whose firm has been designated (if any designated) within the Contract Documents as the Engineer to provide engineering services on the project.
- CC. Equal: Equal in opinion of Architect. Burden of proof of equality is responsibility of Contractor.
- DD. Exposed: Work exposed to view in the finished Work, including behind louvers, grilles, registers and various other construction elements.
- EE. Final Acceptance or Final Completion: All Work satisfactorily completed in accordance with Contract Documents. It includes, but is not limited to:
1. All Systems having been tested and accepted as having met requirements of Contract Documents.
 2. All required instructions and training sessions having been given by Contractor.
 3. All as-built drawings and operations and maintenance manuals and Machine Inventory Sheets having been submitted by Contractor, reviewed by Architect/Engineer and accepted by Owner.
 4. All punch list work, as directed by Owner, having been completed by Contractor.
 5. Generally all work, except Contractor maintenance after Final Acceptance, having been completed to satisfaction of Owner.
- FF. Force-Account: Work directed to be performed without prior agreement as to lump sum or unit price cost thereof, and which is to be billed at cost for labor, materials, equipment, taxes, and other costs, plus a specified percentage for overhead and profit.
- GG. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- HH. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

REFERENCES

- II. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- JJ. Inspector: The person engaged by Owner to inspect the workmanship, materials, or manner of construction of buildings or portions of buildings, to determine if such construction complies with the Contract Documents and applicable codes.
1. The inspector is subject to approval by the Architect, Owner and he will report to Owner.
 2. The terms "Inspector" and "Project Inspector" are used interchangeably in the Contract Documents.
- KK. Latent: Not apparent by reasonable inspection, including but not limited to, the inspections and research required as a condition to bidding under the General Conditions.
- LL. Material or Materials: These words shall be construed to embrace machinery, manufactured articles, materials of construction (fabricated or otherwise), and any other classes of material to be furnished in connection with Contract, except where a more limited meaning is indicated by context.
- MM. Milestone: A principal event specified in Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all Work.
- NN. Modification: Same as Contract Modification.
- OO. Not In Contract: Work that is outside the scope of work to be performed by Contractor under this Contract.
- PP. Notice Of Award: A written notice given by Owner to lowest responsive, responsible bidder advising that Bidder's bid and other qualifying information is acceptable to Owner, requiring Bidder to fulfill the requirements of the Contract.
- QQ. Notice To Proceed: A written notice given by Owner to Contractor fixing the date on which the Contract Time will commence to run and on which contractor shall start to perform Contractor's obligations under the Contract Documents.
- RR. Off Site: Outside geographical location of the Project.
- SS. Owner: Individual or entity named as Owner in Section 01 1100 "Summary of Work. Unless otherwise expressly indicated or required by the context of usage, the term "Owner" as used in the Contract Documents shall be deemed references to Owner.
- TT. Owner-Furnished, Contractor-Installed: Items furnished by Owner at its cost for installation by Contractor at its cost under this Contract.
- UU. Owner Representative(s): The person or persons assigned by Owner to be Owner's representatives or, if so designated, agent(s) at the site.
- VV. Progress Report: a periodic report submitted by Contractor to Owner with progress payment invoices accompanying actual work accomplished to the Project Schedule.
1. See Section 01 2900 "Payment Procedures"
 2. See Section 01 3200 "Construction Progress Documentation"
 4. See Document 00600 General Conditions.

REFERENCES

- WW. Project: Total construction of which Work performed under this Contract may be whole or part.
- XX. Project Manual: Project Manual consists of Bidding Requirements, Agreement, Bonds, Certificates, Contract Conditions, and Specifications. The Project Manual is deemed to include and incorporate all matters noted in any Addenda issued by or on behalf of the Owner during the bidding for the Work.
- YY. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- ZZ. Provide": Furnish and install, complete and ready for the intended use.
- AAA. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- BBB. Request For Information (RFI): A document prepared by Contractor, Owner or Architect/Engineer requesting information from one of the parties regarding the Project or Contract Documents. The RFI system is also a means for Owner and Architect to submit Contract Document clarifications or supplements to Contractor.
- CCC. Required: "As required", "As needed" and terms of similar import, where used, shall mean as required or as needed to complete the item or effort in question in accordance with the applicable standards and specifications for the quality indicated.
- DDD. RFI-Reply: A document consisting of supplementary details, instructions or information issued by the Architect/Engineer, which clarifies or supplements Contract Documents and with which Contractor shall comply. RFI-Replies do not constitute changes in Contract Sum or Contract Times except as otherwise agreed in writing by Owner. RFI-Replies will be issued through the RFI administrative system.
- EEE. Samples: Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
- FFF. Shop Drawings: All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the work.
- GGG. Shown: As indicated on Drawings.
- HHH. Site: The particular geographical location of Work performed pursuant to Contract, including staging areas, work areas, storage and lay down areas, access and parking.
- III. Specifications: The written portion of the Contract Documents consisting of requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.
- JJJ. Specified: As written in Specifications.
- KKK. Subcontractor: A person or entity who has a direct contract with Contractor to perform a portion of the Work at the site. The term "subcontractor" is referred to throughout the Contract

Documents as if singular in number and neuter in gender and means a subcontractor or an authorized representative of the subcontractor. The term "subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

LLL. Substantial Completion: The Work (or a specified part thereof) has progressed to the point where, in the opinion of the Architect/Engineer as evidenced by a Certificate of Substantial Completion, it is sufficiently complete, in accordance with Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment is evidenced by written recommendation of the Architect/Engineer for final payment. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

MMM. Supplemental Instruction: A written work change directive to Contractor from Architect/Engineer, approved by Architect, ordering alterations or modifications which do not result in change in Contract Sum or Contract Times, and do not substantially change Drawings or Specifications.

NNN. Underground Facilities: All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: Electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

OOO. Work: The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all is required by the Contract Documents. Wherever the word "work" is used, rather than the word "Work", it shall be understood to have its ordinary and customary meaning.

1. Wherever words "as directed", "as required", "as permitted", or words of like effect are used, it shall be understood that direction, requirements, or permission of Owner or Architect is intended. Words "sufficient", "necessary", "proper", and the like shall mean sufficient, necessary or proper in judgment of Owner or Architect. Words "approved", "acceptable", "satisfactory", "favorably reviewed" or words of like import, shall mean approved by, or acceptable to, or satisfactory to, or favorably reviewed by Owner or Architect.
2. Wherever the word "may" is used, the action to which it refers is discretionary. Wherever the word "shall" is used, the action to which it refers is mandatory.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

REFERENCES

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated in the Contract Documents.
- E. Except as otherwise specifically stated in the Contract Documents or as may be provided by Change Order, or supplemental instruction, the provisions of the Contract Documents shall take precedence in resolving conflicts, errors, ambiguity or discrepancy between the Contract Documents and:
 1. The provisions of standards, specifications, manuals, codes, or instructions (whether or not specifically incorporated by reference in the Contract Documents); or
 2. The provisions of laws or regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such law or regulation).
- F. No provision of referenced standards, specifications, manuals, codes or instructions shall be effective to change the duties and responsibilities of Owner, Contractor or Architect/Engineer, or their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents, nor shall it be effective to assign to Owner, Architect/Engineer or their consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

1.4 REPORTING AND RESOLVING DISCREPANCIES:

- A. Report in writing at once to Owner, with copies to Architect, all conflicts, errors, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and provisions of laws or regulations applicable to the performance of the Work or of standards, specifications, manual, codes or instructions of manufacturers or suppliers. Do not proceed with the Work affected until direction to do so is given by the Architect.

1.5 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 1. Retain entries below if referenced in Specifications. List has been checked against information obtained from the Internet; it includes only those organizations referenced in the Section Text in MasterSpec Sections. Insert other abbreviations, acronyms, and names used in Specifications or added to the office master.
 2. AABC - Associated Air Balance Council; www.aabc.com.

REFERENCES

3. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
4. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
5. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
6. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
7. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.

REFERENCES

40. AWWA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
50. CDA - Copper Development Association; www.copper.org.
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - Canadian Standards Association; www.csa.ca.
65. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; www.ec-central.org.
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.

REFERENCES

80. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
81. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
82. FM Approvals - FM Approvals LLC; www.fmglobal.com.
83. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
84. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarooft.com.
85. FSA - Fluid Sealing Association; www.fluidsealing.com.
86. FSC - Forest Stewardship Council U.S.; www.fscus.org.
87. GA - Gypsum Association; www.gypsum.org.
88. GANA - Glass Association of North America; www.glasswebsite.com.
89. GS - Green Seal; www.greenseal.org.
90. HI - Hydraulic Institute; www.pumps.org.
91. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
92. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
93. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
94. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
95. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
96. IAS - International Approval Services; (See CSA).
97. ICBO - International Conference of Building Officials; (See ICC).
98. ICC - International Code Council; www.iccsafe.org.
99. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
100. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
101. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
102. IEC - International Electrotechnical Commission; www.iec.ch.
103. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
104. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
105. IESNA - Illuminating Engineering Society of North America; (See IES).
106. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
107. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
108. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
109. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
110. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
111. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
112. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
113. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
114. ISO - International Organization for Standardization; www.iso.org.
115. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
116. ITU - International Telecommunication Union; www.itu.int/home.

REFERENCES

117. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
118. LMA - Laminating Materials Association; (See CPA).
119. LPI - Lightning Protection Institute; www.lightning.org.
120. MBMA - Metal Building Manufacturers Association; www.mbma.com.
121. MCA - Metal Construction Association; www.metalconstruction.org.
122. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
123. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
124. MHIA - Material Handling Industry of America; www.mhia.org.
125. MIA - Marble Institute of America; www.marble-institute.com.
126. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
127. MPI - Master Painters Institute; www.paintinfo.com.
128. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
129. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
130. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
131. NADCA - National Air Duct Cleaners Association; www.nadca.com.
132. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
133. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
134. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
135. NCMA - National Concrete Masonry Association; www.ncma.org.
136. NEBB - National Environmental Balancing Bureau; www.nebb.org.
137. NECA - National Electrical Contractors Association; www.necanet.org.
138. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
139. NEMA - National Electrical Manufacturers Association; www.nema.org.
140. NETA - InterNational Electrical Testing Association; www.netaworld.org.
141. NFHS - National Federation of State High School Associations; www.nfhs.org.
142. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
143. NFPA - NFPA International; (See NFPA).
144. NFRC - National Fenestration Rating Council; www.nfrc.org.
145. NHLA - National Hardwood Lumber Association; www.nhla.com.
146. NLGA - National Lumber Grades Authority; www.nlga.org.
147. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
148. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
149. NRCA - National Roofing Contractors Association; www.nrca.net.
150. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
151. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
152. NSPE - National Society of Professional Engineers; www.nspe.org.
153. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
154. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
155. NWFA - National Wood Flooring Association; www.nwfa.org.
156. PCI - Precast/Prestressed Concrete Institute; www.pci.org.

REFERENCES

157. PDI - Plumbing & Drainage Institute; www.pdionline.org.
158. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
159. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
160. RFCI - Resilient Floor Covering Institute; www.rfci.com.
161. RIS - Redwood Inspection Service; www.redwoodinspection.com.
162. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
163. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
164. SDI - Steel Deck Institute; www.sdi.org.
165. SDI - Steel Door Institute; www.steeldoor.org.
166. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
167. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
168. SIA - Security Industry Association; www.siaonline.org.
169. SJI - Steel Joist Institute; www.steeljoist.org.
170. SMA - Screen Manufacturers Association; www.smainfo.org.
171. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
172. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
173. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
174. SPIB - Southern Pine Inspection Bureau; www.spib.org.
175. SPRI - Single Ply Roofing Industry; www.spri.org.
176. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
177. SSINA - Specialty Steel Industry of North America; www.ssina.com.
178. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
179. STI - Steel Tank Institute; www.steeltank.com.
180. SWI - Steel Window Institute; www.steelwindows.com.
181. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
182. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
183. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
184. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
185. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
186. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
187. TMS - The Masonry Society; www.masonrysociety.org.
188. TPI - Truss Plate Institute; www.tpinst.org.
189. TPI - Turfgrass Producers International; www.turfgrasssod.org.
190. TRI - Tile Roofing Institute; www.tilerooting.org.
191. UBC - Uniform Building Code; (See ICC).
192. UL - Underwriters Laboratories Inc.; www.ul.com.
193. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.

REFERENCES

194. USAV - USA Volleyball; www.usavolleyball.org.
195. USGBC - U.S. Green Building Council; www.usgbc.org.
196. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
197. WASTEC - Waste Equipment Technology Association; www.wastec.org.
198. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
199. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
200. WDMA - Window & Door Manufacturers Association; www.wdma.com.
201. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
202. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. Retain entries below if referenced in Specifications. List has been checked against information obtained from the Internet; it includes only those agencies referenced in the Section Text in MasterSpec Sections. Insert abbreviations, acronyms, and names used in Specifications or added to the office master.
2. DIN - Deutsches Institut für Normung e.V.; www.din.de.
3. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
4. ICC - International Code Council; www.iccsafe.org.
5. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.

1. Retain entries below if referenced in Specifications. List has been checked against information obtained from the Internet; it includes only those agencies referenced in the Section Text in MasterSpec Sections. Insert abbreviations, acronyms, and names used in Specifications or added to the office master.
2. COE - Army Corps of Engineers; www.usace.army.mil.
3. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
4. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
5. DOD - Department of Defense; <http://dodssp.daps.dla.mil>.
6. DOE - Department of Energy; www.energy.gov.
7. EPA - Environmental Protection Agency; www.epa.gov.
8. FAA - Federal Aviation Administration; www.faa.gov.
9. FG - Federal Government Publications; www.gpo.gov.
10. GSA - General Services Administration; www.gsa.gov.
11. HUD - Department of Housing and Urban Development; www.hud.gov.
12. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <http://eetd.lbl.gov>.

13. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 14. SD - Department of State; www.state.gov.
 15. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
 16. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
 17. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
 18. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
 19. USP - U.S. Pharmacopeia; www.usp.org.
 20. USPS - United States Postal Service; www.usps.com.
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. Retain entries below if referenced in Specifications. List has been checked against information obtained from the Internet; it includes only those organizations responsible for the standards and regulations referenced in the Section Text in MasterSpec Sections. Insert abbreviations, acronyms, and names, such as standards and regulations from other Federal agencies, used in Specifications or added to the office master.
 2. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 3. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
 4. DSCC - Defense Supply Center Columbus; (See FS).
 5. FED-STD - Federal Standard; (See FS).
 6. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 7. MILSPEC - Military Specification and Standards; (See DOD).
 8. USAB - United States Access Board; www.access-board.gov.
 9. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. Retain entries below if referenced in Specifications. List has been checked against information obtained from the Internet; it includes only those agencies referenced in the Section Text in MasterSpec Sections. Insert abbreviations, acronyms, and names, such as state highway departments, used in Specifications or added to the office master.

REFERENCES

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

- SECTION 01 4339 -**MOCKUP REQUIREMENTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Construct mockups prior to installation of final work, to permit review of appearance, quality, coordination, compatibility and relation to adjacent work, and to test alternate colors and finishes of materials. Provide mockup identical in every respect to the final work specified.
- B. Construct mockups out of sequence as part of the Contract.
- C. Mockups will remain in place through the completion of the work and shall serve as standard for appearance and other attributes as specifically noted by the Architect.
- D. Provide design by Contractor's engineer as required to ensure the structural stability of mockups.
- E. Architect and other interested parties will make visual examination of the mockup during construction.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4553 "Facade Mockup Testing".
- C. Section 01 8316 "Exterior Enclosure Performance Requirements".
- D. Pertinent sections specifying mockups.

1.4 DEFINITIONS

- A. Mockup: Independent structures that represent components of a portion of the building as indicated, and where located, on the Drawings.

1.5 ACTION SUBMITTALS

- A. Sequence: All required submittals must be accepted prior to construction of mockup including but not limited to product data, samples and shop drawings as required.
 - 1. Project Schedule shall take account of early submittal requirements of these items to Architect for review and approval.
 - 2. Samples: All selection samples and verification must be approved prior to preparation of mockup.
- B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer and bearing his seal and signature, detailing fabrication and assembly of mockups.
 - 1. Provide fully detailed drawings showing all components, including bracing and footings for independent elements which are required for free-standing mockup, although not part of the mockup itself.
 - 2. Identify all assembly components and materials, indicate means of full integration with surrounding adjacent materials.
 - 3. Include all details showing edges, perimeters, junctions and transitions, seals, sealant details, re-glazing details, water collection and drainage systems, anchorage and all other pertinent details necessary to illustrate and verify the performance capabilities of the proposed assembly.
- C. Delegated-Design Submittal: For mockup supporting structure.
 - 1. Structural Calculations: Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation, registered within the State of Arizona demonstrating compliance with referenced code and specified criteria.
- D. Construction Schedule: Include mockup activities including administrative and procedural submittals and materials ordering and assembly on Construction Schedule. Identify every element required for each mockup. Allow ample advance time for preparation and approval of mockup prior to placement of final orders for work without delay to progress or completion of the work.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Professional Engineer.

1.7 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of mockups that are similar to those indicated for this Project in material, design, and extent.
- B. Installer Qualifications: Installer experienced in performing work of the section who has specialized in installation of work similar to that required for this project and who will perform installation of final work.
- C. Comply with standards specified for permanent work.

MOCKUP REQUIREMENTS

- D. Secure mockup in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.
- E. Provide finish to match approved samples.

1.8 SCHEDULING

- A. Notify Architect at the start of construction of mockup and provide progress reports to allow the Architect to schedule observations of mockups.
- B. After approximately 50 percent of each mockup has been constructed, request the Architect's preliminary review before completion. Incorporate changes or variations requested by the Architect into the mockup during their construction and prior to their completion, insofar as possible.
- C. Obtain Architect and Owner Representative's acceptance of visual qualities of the mockup prior to commencing the corresponding work for the Project.
- D. Schedule the completion and reworking of mockup necessary to obtain acceptance to avoid delay in the construction schedule of the Project. Update the Construction Schedule to reflect required revisions to mockup.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Design Loads and Performance Criteria: As specified in Section 01 8316 and as specified in the technical sections.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design mockup supports.
- C. Provide full size mockup of typical wall construction and other elements as specified in accordance with details on Drawings in the sizes indicated, or if not indicated, in size and in location(s) directed by Architect.
 - 1. Construction shall be by the same personnel employed for the final work.
 - 2. Demonstrate aesthetic effects, establish quality standards for fabrication and installation and provide examples for testing as specified in related section.
- D. Mockups shall be free-standing and shall not be incorporated into the final work, unless otherwise approved by the Architect in writing.
- E. Assemble and erect complete, with specified attachment and anchorage devices, flashings, seals and finishes.
- F. Coordination: Utilize mockups to ascertain elements as designed fit into space provided and to coordinate and sequence work of multiple sections in an assembly.

- G. Should mockup fail to meet the Architect and Owner Representative's approval, take down or rework until acceptable.
- H. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- I. Approved mockup will form the standard for comparison for Architect's judging aesthetic qualities of the finished work, including the interface with adjacent materials and components, as applicable.
 - 1. Make modifications required by Architect to achieve acceptable mockups, at no additional cost to the Owner.
 - 2. Mockup will be used by the Architect to test color and material alternatives and to review and accept final colors, textures and finishes. Up to 5 different colors may be tested for each component.
 - 3. Some mockups will be used for exterior façade testing as specified in related section 01 4553.
- J. Remove unacceptable mockups from the site immediately
- K. Mockup shall be approved by the Architect and Owner's Representative in writing, as a condition precedent to approval of shop drawings for work represented by the mockups.

2.2 MOCKUP DESCRIPTION

- A. Refer to drawings and various technical sections for descriptions of mockups and in-place installations required for review of materials and coordination.
- B. Provide quality control over work of various sections of specifications, manufacturers, products, services, workmanship, and site conditions to produce mockup in accordance with the Contract Documents.
- C. Guest Room Mockup: Provide a sample application in one Guest Room of both ceilings and wall for acceptance by the Owner's representative and to serve as a sample standard of quality for the balance of the work. Rework sample room if necessary to obtain Owner's acceptance.
 - 1. Location to be selected by Architect, if not identified on drawings.

2.3 MATERIALS AND COMPONENTS

- A. Materials and finishes shall comply with the requirements specified in the various applicable Sections of the Specifications, and shall match previously submitted and approved samples.
- B. Mockup shall include all related construction materials and finishes having a visual or technical effect upon the completed work.

MOCKUP REQUIREMENTS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions with installer present and verify that field conditions are acceptable and are ready to receive work. Correct conditions detrimental to the proper and timely performance of this work before proceeding with installation. Commencement of work indicates acceptance of substrates

3.2 INSTALLATION

- A. Install components in strict accordance with manufacturer's instructions and approved shop drawings. Use proper fasteners and hardware for material attachments as specified and as required to suit field conditions.
- B. Install items plumb and level, measured from established lines and levels, accurately fitted, free from distortion or defects.
- C. Provide temporary bracing or anchors in formwork for items which are to be built into concrete or similar construction.
- D. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- E. Install materials in a manner that will duplicate the appearance in the completed building.
 - 1. Provide materials and personnel for prompt continuous construction of mock-ups.
 - 2. In constructing mockup, take measure to ensure the safety of Project personnel and the public.
 - 3. Construct mockup using the same construction personnel, means, and methods as intended for use on final work.
 - 4. Construct mockup in accordance with details indicated on the drawings and approved Shop Drawings.
 - 5. Mockups shall be located where specified or directed, and shall not be built "in-place" as part of the permanent construction.
- F. Construct mockup test specimens to match details shown in the architectural drawings under the manufacturer's/installer's direct supervision and employ workmen as they would be employed during the final construction at the job site.
 - 1. Construct in strict accordance with endorsed shop drawings. Any deviations from or additions to details shown on drawings are subject to final review and action by the Architect.
 - 2. Mockup test specimens shall be full size and fully represent the conditions of final construction including structural design of members and anchorages. Mock up specimens shall include not only the window but the surrounding framing, flashings, wall finishes and related materials.
 - 3. Mockup test specimens shall include joint sealants, glazing, and finishes. Install sufficient interior trim, mullion and horizontal covers to demonstrate details of completed work. Leave trim installed to demonstrate that design is not affected by testing criteria.

MOCKUP REQUIREMENTS

4. Provide at least one extra light of glass for each type and size used for glazed mockups. Replace glass breaking during testing with new glass and continue tests.
5. Repeated material breakage shall constitute failure. Prior to testing remove and re-glaze selected glass lites, using details and procedures intended for glass replacement on the actual building. Re-glazed lites must satisfy all test criteria.

G. Record Drawings for Mockups:

1. Prepare record drawings for mockups as specified in related Section 01 4553.

3.3 PROTECTION

- A. Protect and maintain mockup until completion of construction or until removal is directed.
- B. Repair damage to mockup immediately upon occurrence. Maintain mockup and surrounding site in a safe and clean condition.
- C. Do not permit traffic near unprotected finish surface(s).

3.4 REMOVAL

- A. Remove mockup at the completion of the work in a manner that shows no evidence of mockup previous existence. Complete site work at area of mockups in accordance with Contract Drawings.

- END OF SECTION -

- SECTION 01 4553 -**FACADE MOCKUP TESTING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Exterior enclosure performance mockup testing.
 - 2. Manufacturer's sealant tests.
 - 3. Factory sealant tests.
 - 4. Field sealant tests.
 - 5. Heat soak tests on tempered glass.
 - 6. Field water tests.
- B. Also Included:
 - 1. Testing Agency Selection, Payment, Duties
 - 2. Testing Agency Limits on Authority
 - 3. Contractor Responsibilities
 - 4. Architect/Engineer Responsibilities.
 - 5. Deficient Work and Re-Testing Procedures

1.3 REFERENCES

- A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- B. ASTM C802 - Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction.
- C. ASTM C1021 - Practice for Laboratories Engaged in the Testing of Building Sealants.
- D. ASTM E329 - Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
- E. ASTM E543 - Practice for Determining the Qualification of Nondestructive Testing Agencies.

- F. ASTM E548 - Practice for Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies.
- G. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.
- H. BS EN 14179-1 Standard - Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass, Intended To Be Used In Buildings And Construction Works.

1.4 DEFINITIONS

- A. Deficient Work: Work found to be in not in compliance with the Contract Documents.
 - 1. Work permitting Leakage or Water Penetration as defined in this section is deemed deficient work.
- B. Water Penetration: This definition of water leakage shall govern over other definitions which may appear in reference documents. There shall be no water leakage as defined below:
 - 1. All water shall be contained and drained to the exterior.
 - 2. There shall be no wetting of a surface that would be visible to building occupants.
 - 3. There shall be no staining or other damage to any part of the completed building, its finishes, or its furnishings.

1.5 RELATED REQUIREMENTS

- A. Section 01 8316 "Exterior Enclosure Performance Requirements": Design Loads and Performance Criteria.
- B. Section 04 2115 "Adhered (Thin) Brick Veneer".
- C. Section 06 1600 "Sheathing"
- D. Section 07 1900 "Water Repellent and Graffiti Resistant Coatings"
- E. Section 07 2419 "Exterior Insulation and Finish System (EIFS)"
- F. Section 07 2500 "Fluid-Applied Membrane Air Barriers".
- G. Section 07 4213 "Metal-Faced Composite Wall Panel Assemblies"
- H. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing" for PVC membrane roofing.
- I. Section 07 9213 "Exterior Facade Joint Sealants": Sealants used in Exterior Enclosure.
- J. Section 07 9523 "Exterior Expansion Control"
- K. Section 07 8446 "Fire-Resistive Joint Systems".
- L. Section 08 3214 "Exterior Glazed Panel Folding Doors".

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- M. Section 08 4113 "Aluminum-Framed Entrances and Storefronts".
- N. Section 08 4413 "Glazed Aluminum Curtain Walls".
- O. Section 08 8013 "Exterior Glazing".
- P. Section 09 2236 "Metal Lath & Accessories"
- Q. Section 09 2513 "Acrylic Modified Portland Cement Plastering".
- R. Section 09 3053 "Exterior Tiling".
- S. Section 09 9623 "Graffiti Resistant Coatings" for coating applied to EIFS.

1.6 SUBMITTALS

- A. Testing Agency Information and Qualifications: Prior to start of Work, submit the following:
 - 1. Testing Agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Current copy of Testing Agency's established Quality Assurance Manual meeting criteria of the American National Standards Institute (ANSI) N 45.2 (1971) assuring that tests and/or inspections will be performed in accordance with established and accepted procedures and criteria.
 - 3. Copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 4. Test procedures, including the basic chamber steel layout and dial indicator locations for the structural testing.
 - 5. Copy of latest Test Equipment certification attesting adherence to specified standards.
 - 6. Copy of all Test procedures and proposed Test schedule coordinated with Contractor's Construction Progress Schedule.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect, Engineer, Owner, and Contractor, with additional copies to other parties as noted.
- C. Construction Schedule:
 - 1. Include testing activities, with administrative and procedural submittals and materials ordering and assembly on Construction Schedule.
 - 2. Identify every element required for each test.
 - 3. Allow ample advance time for preparation and approval of test mockup prior to placement of final orders for work without delay to progress or completion of the work.

1.7 QUALITY ASSURANCE

- A. Conform to requirements of the referenced standards.

1.8 TESTING AGENCY QUALIFICATIONS

- A. Testing Agency Qualifications:

1. Meet "Recommended Requirements for Independent Laboratory Qualification, latest edition, published by American Council of Independent Laboratories.
 2. Meet ASTM E329, including the requirement that all inspection and testing services must be under the direction of an experienced testing technician with at least ten years experience in inspection and testing of exterior enclosure systems construction and materials.
- B. Equipment: Calibrate testing equipment at maximum twelve calendar month intervals by devices of accuracy traceable to the National Bureau of Standards or accepted values of natural physical constants.
- C. Personnel: Testing Agency on-site supervisory personnel shall be qualified and certified in the specified fields of testing as required in appropriate Quality Assurance and Calibration Manuals.
- D. Laboratory: Authorized to operate in State in which Project is located.
- E. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
- F. Approved testing Agencies:
1. Agencies:
 - a. Construction Consulting Laboratory West – Ontario, California
 - b. Smith Emery Laboratory – Los Angeles, California
 - c. Architectural Testing – Los Angeles, CA, www.archtest.com
 2. Other facilities may be acceptable on the following conditions:
 - a. The proposed agency can carry out all specified tests in accordance with the specified standards.
 - b. The proposed agency is entirely independent from any and all contractors, subcontractors, or manufacturers involved in this project.
 3. All proposed test laboratories are subject to acceptance by the Architect and Owner whose decision is final.
 - a. Detailed information on facilities and test equipment for alternate test sites must be submitted at the time of bid.
- G. The approved testing agency shall conform to the following:
1. General:
 - a. Shall be solely responsible for conducting and reporting on all of the tests.
 - b. Shall exclusively follow the direction of the Architect and his consultants with regards to all test procedures and testing requirements.
 2. Prior to any testing:
 - a. Test procedures shall be submitted to the Architect for review and action including the basic chamber steel layout and dial indicator locations for the structural testing.
 - b. Test schedule shall be submitted to the Architect for review and action.

1.9 TESTING AGENCY SELECTION AND PAYMENT

- A. Owner will employ and pay for the services of an Independent Testing Agency, herein after called the Owner's Testing Agency, to perform specific testing, in accordance with the Specifications.

FACADE MOCK-UP TESTING

1. Owner will pay for initial testing indicated under specific specification sections and specifically noted to be paid by the Owner.
 2. Owner will pay for additional testing required for deficient work or other acts of the Contractor and deduct these costs from the Contract Sum via deductive Change Order. Refer to Article DEFICIENT WORK AND RE-TESTING PROCEDURES.
- B. Responsibility for Costs: All costs for testing and inspections by the Testing Agency including the fees and travel expenses, incurred by the Architect and his consultant shall be paid by the Owner.
- C. Employment of any testing laboratory by Contractor shall be subject to Owner approval. Contractor's laboratory shall meet all quality requirements of this section.
- D. Owner reserves the right to test any material or work of Project at any time, whether or not tests are indicated in Contract Documents.

1.10 TESTING AGENCY DUTIES

- A. Cooperate with Architect and Contractor: provide qualified personnel after due notice.
- B. Perform specified reviews, inspections, sampling and testing of materials and methods of construction, as specified by the various technical specifications sections, and as requested by the Architect or Owner.
- C. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
- D. Perform specified sampling and testing of Products in accordance with specified standards. Ascertain compliance of materials with requirements of Contract Documents.
- E. Promptly submit written report of each test and inspection as described in this section; one copy each to Architect, Engineer, Owner, Contractor, and one copy to Record Documents File.
- F. Promptly notify Architect and Contractor of observed irregularities or deficiencies of work or products.
- G. Interpretation of test results, when requested by Architect.
- H. Perform additional tests as required by Architect or the Owner.
- I. Attend preconstruction meetings and progress meetings.

1.11 LIMITATIONS OF AUTHORITY OF TESTING AGENCY

- A. Testing Agency is not authorized to:
 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 2. Approve or accept any portion of the Work.
 3. Perform any duties of the Contractor.
- B. Testing Agency has no authority to stop the Work.

- C. Testing Agency shall not:
 - 1. Act as Consultant to the Contractor or any subcontractor or supplier for this project.
 - 2. Conduct testing without representatives of the Architect or Owner being present, without prior written consent.

1.12 CONTRACTOR'S RESPONSIBILITIES

- A. Employment of the Testing Agency shall in no way relieve Contractor's obligations to perform the Work of the Contract.
- B. Cooperate with the Testing Agency to facilitate the execution of its required services; cooperate with Agency personnel; provide access to work; to manufacturer's operations.
- C. Provide information regarding activities requiring special inspection and tests to Architect and Testing Agency upon request.
- D. Secure and deliver to the Testing Agency adequate quantities of representational samples of materials proposed to be used and which require testing.
- E. Provide to the Testing Agency the design mixes and material properties proposed to be used for materials and material mixes which require control by the Testing Agency.
- F. Provide copies of Products and Material test reports, certifications and affidavits as required.
- G. Provide incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. To provide storage and curing of test samples.
- H. Notify Testing Agency sufficiently in advance of operations to allow for Testing Agency assignment of personnel and scheduling of tests.
 - 1. Notify Testing Agency and Architect/Engineer forty-eight (48) hours prior to expected time for operations requiring testing services.
 - 2. Become familiar with time constraints of tests required. Schedule work to allow time for performance of required tests.
- I. When tests or inspections cannot be performed after such notice the cost to the Owner for Testing Agency personnel and travel expenses incurred due to Contractor's negligence shall be deducted from the Contract Price.
- J. Make arrangements with Testing Agency and pay for additional samples and tests required for Contractor's convenience.
- K. Schedule Fabrication Work for Efficient Inspection and Testing:
 - 1. If Contractor does not schedule fabricator work efficiently, the resulting costs of excess inspection charges shall be paid by the Owner and deducted from the Contract Sums owed to the Contractor in the manner specified below for re-testing of deficient work.

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- L. Incur expenses due to re-testing and re-inspection necessitated by defective work or other acts of the Contractor, including expenses incurred by the Owner for compensating the Testing Agency as described in the Article DEFICIENT WORK AND RE-TESTING PROCEDURES.

1.13 ARCHITECT/ENGINEER RESPONSIBILITIES

- A. Architect/Engineer is not responsible for notification of the Testing Agency or scheduling its work.
- B. Architect will not be responsible for the actions of the Testing Agency.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 MOCKUP TESTING

- A. Mockups: Perform field testing on mockups according to requirements in "Field Quality Control" Article.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- B. Exterior Enclosure Mockup Testing Requirements:
 - 1. General: Performance requirements specified for building assemblies shall apply to test mockups and samples. The same performance is also required of the finished construction in natural conditions equivalent to or less severe than the test conditions.
 - 2. Account for variations in criteria (such as wind pressure) over the surface of the building, in testing of mockup s and samples.
- C. Construction of final work shall not begin without approval following successful results of the mockup performance tests.
- D. The Architect's Representative shall be the sole judge of the mockup test conditions.
 - 1. The mockup assemblies and installations are subject to observation and inspection by the Architect and Consultant throughout its construction and testing.
- E. The Contractor shall coordinate testing agency availability, shipping schedules and mockup construction schedules directly with the testing agency.
 - 1. Provide minimum one-month notice before beginning assembly and construction of mockup s.
- F. Preliminary and unofficial tests are not permitted except in the presence of the Architect's Representative. Three day notification shall be given prior to any such testing. All preliminary or unofficial test results and all remedial work shall be documented in the laboratory report.

- G. Full time attendance by the Contractor's representative(s) shall be provided for during the assembly and erection of the test specimens and for all testing of the test specimens.
- H. Mockup test values shall correspond to the values specified in the technical sections and the reference standards cited.
- I. Record Drawings for Mockups
 - 1. Submit shop drawings for review and action before proceeding with final construction of mockup elements.
 - 2. Provide reviewed shop drawings and calculations (including glass calculations) fully demonstrating specified performance of structural elements, connections and anchorages for both working conditions and test load conditions to the Testing Agency for their use.
 - 3. Testing Agency shall accurately and neatly record on the above mentioned shop drawings all changes, revisions, modifications, etc. made to the test specimen, which shall become the record drawings.
 - 4. At completion of the testing and after review of the test reports, Testing Agency shall submit a copy of the marked-up record drawings to the Architect, who will provide a copy to the Contractor.
- J. Mockup Laboratory Tests: Conduct the following tests on mockups.
 - 1. Air Infiltration Test: ASTM E 283
 - a. Differential static test pressure: 6.24psf.
 - b. Determine Chamber leakage accurately. Do not estimate.
 - c. Air leakage of fixed wall area: Not to exceed 0.06 cfm per square foot of exterior surface plane of wall.
 - 2. Static Water Infiltration Test: ASTM E331.
 - a. Differential static test pressure: 12 psf.
 - 1) Water leakage: None, as defined in this section.
 - b. Occurrence of condensation during water infiltration tests is acceptable.
 - c. Where test sequence or test failure requires successive water infiltration tests, the only means permitted to drain water from internal cavities shall be gravity drainage through the weep system for a minimum of 15 minutes. Air pressure, removal of parts or other means of draining water shall not be used.
 - d. If water infiltration tests have failed after structural tests or differential movement tests, repeat structural tests prior to repeating water infiltration test.
 - e. Location of leak sources shall not be determined by soaping or use of smoke.

3.2 REPORTS AND CERTIFICATION

- A. Testing Agency shall submit copies of reports of tests and inspection and certification as described in the Article SUBMITTALS.
- B. After tests or inspections have been made, the Testing Agency shall distribute copies of all tests and inspection reports in standard outline form. Reports shall include the following:
 - 1. Date issued.
 - 2. Project title and number.

FACADE MOCK-UP TESTING

3. Testing Agency name, address and telephone number.
4. Name and signature of Agency inspector or technician.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Report number
9. Mockup test number
10. Identification of product and specification section.
11. Location of sample or test in the Project.
12. Type of inspection or test.
13. Observations regarding compliance with contract documents.
14. Results of tests
15. Statement of Compliance or Non-compliance with Contract Documents, specifically noted and attested by signature of responsible individual performing test.

3.3 SEALANT TESTING

A. Manufacturer's Testing

1. Provide to sealant manufacturer samples of all relevant substrates receiving or contacting sealants, including but not limited to finished aluminum, stainless steel, vision glass, spandrel glass, gaskets, spacers, setting blocks and backers as well as any other material which will contact the sealant either during installation or normal wall movements.
2. Sealant manufacturer shall perform the following tests on sealant to verify:
 - a. ASTM C794 – adhesion
 - b. ASTM C1087 – chemical stability
 - c. ASTM C1248 – staining or migration
 - d. ASTM C1248 (modified) – effects on laminated glass
3. Laboratory Testing on Structural Silicone: Perform the following prior to the approval of structural silicone materials and designs.
 - a. Immersion Test: Laboratory testing for adhesion of a minimum of three (3) samples after water immersion of seven (7) days.
 - b. Tensile Load: Surpass a tensile load per linear centimeter equivalent to three times specified design wind pressure.
 - c. Manufacturer shall submit a full report on this testing to the Architect for review and acceptance before further testing.

B. Factory Testing on Structural Silicone: Perform the following during factory production of unitized panels:

1. Deglazing tests: One (1) panel in every fifty (50) panels produced.
 - a. Following deglazing, check sealant for proper mix, cure and adhesion.
2. Test Rate Reduction: Once ten (10) successive, successful deglazing tests are recorded, the Architect may direct reduction of the rate of testing to one (1) panel in every one hundred (100) panels produced.

- C. Field Sealant Testing: Perform a minimum of twenty (20) site tests for weather seal sealant adhesion in accordance with approved methods:
 - 1. Perform testing at equal intervals during the construction period.
 - 2. Perform testing under the observation of the Architect or his Consultant.
 - 3. Submit reports on site tests to the Architect as specified in this section.
- D. Should sealant failures be found, perform additional testing to determine extent of the problem.
 - 1. Replace all failed sealants promptly and retest for Architect's approval. All costs associated with the required remedial methods are to be borne by the Contractor.

3.4 HEAT SOAK TESTING OF TEMPERED GLASS

- A. All glass which is to be tempered for reasons other than compliance with Code issues shall be subject to heat soak testing. Reference BS EN 14179-1 standard.
- B. Heat Soak test all glass with a surface or edge stress of 7500psi or higher for a minimum of two (2) cycles. Conduct test so the center of the glass lite remains at a minimum temperature of 525oF (275oC) for a period of one hour.
- C. Furnace minimum heat up times shall be as follows for glass thickness indicated:
 - 1. 1/4 -inch lite (6mm) – 30 minutes
 - 2. 3/8 -inch lite (10mm) – 70 minutes
 - 3. 1/2 -inch lite (12mm) – 120 minutes
 - 4. 3/4 -inch lite (19mm) – 270 minutes
- D. Monitor furnace heat output and glass area in each test batch and control to comply with these requirements.
- E. Cool down time: Approximately one half of heat up time.

3.5 FIELD WATER TESTING

- A. Test exterior wall assemblies in accordance with AAMA 501.2 "Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems".
- B. Test exterior wall assemblies in field during construction at 5%, 15%, 30%, 60%, and 90% completion in multiple locations for a total of eight (8) tests minimum, and additional tests as directed by Architect.
 - 1. Location, extent and time of tests as directed by Architect.
 - 2. Total of tested area shall be not less than 1.0% nor more than 10.0% of the exterior wall area except as subsequently authorized by the Owner.
 - 3. Acceptable water penetration shall be as defined in this section.
 - 4. Contractor to provide powered scaffold, hose, water supply, communication system, labor and all other necessary items to perform tests.
 - 5. Schedule out of sequence work necessary, such as sealant work, so that assemblies can be tested as required.

FACADE MOCK-UP TESTING

3.6 DEFICIENT WORK AND RE-TESTING PROCEDURES

- A. Deficient Work: When initial tests indicate deficient work, Contractor shall propose remedial modifications to correct deficiency. Modifications shall :
1. Be constructible under project conditions prevailing.
 2. Meet or exceed specified requirements of quality and durability.
 3. Be accepted by product manufacturer in writing.
 4. Provide all specified warranties.
 5. Be subject to review and action by the Architect before implementation.
- B. In case of disagreement as to the cause of the test failure, the decision shall be made by the Architect and his Consultant.
- C. Architect will determine scope of additional tests and test methods.
- D. Following modifications revise and retest mockup.
- E. Subsequent re-testing shall be performed by the same Testing Agency.
- F. Costs for Testing for Defective Work and other acts of the Contractor: All costs for testing and inspections by the Testing Agency including the fees and travel expenses, incurred by the Architect and his consultant for the following, shall be paid for by the Owner, and deducted from the Contract Sums owed to the Contractor via deductive Change Order. Costs subject to withholding from the Contractor include the following:
1. Additional tests and inspections by Owner's testing agency where initial tests and inspections reveal failure to meet Contract requirements.
 2. Excessive inspection time by Owner's testing agency is required by Contractor's failure to provide sufficient workman or to properly pursue the progress of work.
 3. Test(s) deemed necessary by the Owner/Architect to evaluate any substitution proposed by the Contractor.
 4. Testing and inspection for the Contractor's convenience.
 5. Testing and inspection overtime necessitated by the Contractor's schedule.
- G. In no case shall the Contractor pay the Testing Agency directly.

- END OF SECTION -

- SECTION 01 5000 -**TEMPORARY FACILITIES AND CONTROLS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. This Section specifies temporary services and facilities, including utilities, construction and support facilities, security and protection. Provide facilities ready for use. Maintain, expand and modify as needed. Remove when no longer needed, or when replaced by permanent facilities.
 2. Work of this Section shall include, but not necessarily be limited to, the following:
 - a. Project/Site Conditions
 - b. Use Charges
 - c. Field Office and Storage Sheds
 - d. Temporary Sanitary Facilities
 - e. Temporary Fire Extinguishers
 - f. Temporary Water
 - g. Temporary Electric Power Service and Interior Lighting
 - h. Temporary Telephone Service and Facsimile Service
 - i. Temporary Storm and Sanitary Sewer
 - j. Temporary Heating, Cooling, and Ventilation
 - k. Temporary Paving
 - l. Temporary Enclosures
 - m. Project Identification
 - n. Temporary Exterior Lighting
 - o. Progress Cleaning and Waste Removal
 - p. Surface and Underground Water Control
 - q. Protection of Installed Work
 - 1) Environmental Protection
 - 2) Dust Control
 - 3) Barriers, Barricades, Warning Signs, and Lights
 - r. Removal of Construction Facilities and Temporary Controls

1.3 RELATED REQUIREMENTS

- A. Section 01 1100 "Summary of Work".
- B. Section 01 7700 "Closeout Procedures".
- C. Section 02 4116 "Structure Demolition"

1.4 QUALITY ASSURANCE

- A. Regulations: Each Contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction, including but not limited to:
 - 1. Owner's Requirements
 - 2. Building Code Requirements
 - 3. Health and Safety Regulations
 - 4. Utility Company Regulations
 - 5. Police, Fire Department, and Rescue Squad Rules
 - 6. Environmental Protection Regulations
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC for industry recommendations.
 - 2. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with the normal application of trade regulations and union jurisdictions.
 - 3. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT/SITE CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates of the implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of the temporary service to use of the permanent service.
 - 1. Temporary Use of Permanent Facilities: The installer of each permanent service or facility shall assume responsibility for its operation, maintenance and protection during its use as a construction service or facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on the site.

TEMPORARY FACILITIES AND CONTROLS

1.6 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to the Owner or the Architect. Contractor's cost or use charges for temporary services or facilities will not be accepted as a basis of claim for an adjustment in the Contract Sum or Contract Time.
- B. Other entities using temporary services and facilities include, but are not limited to:
 - 1. Other Nonprime Contractors
 - 2. The Owner's Work Forces and Separate Contractors
 - 3. Occupants of the Project
 - 4. The Architect
 - 5. The Owner's Representative
 - 6. Testing Agencies
 - 7. Personnel of Government Agencies

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Lumber and Plywood: Comply with requirements in Section 06 10 00 - Rough Carpentry.
- C. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire-retardant tarpaulins.
- D. Water: Provide potable water approved by local health authorities.

2.2 EQUIPMENT

- A. Water Hoses: Provide **3/4 -inch** heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
- B. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
- C. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- D. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

- E. Temporary Field Office
1. The General Contractor shall provide and maintain clean, temporary weather-tight offices at the site, in location as approved by the Owner, for the use of the Contractor, his Subcontractors' agents, Owner's Representative, and the Architect, and at which location he or his authorized agent shall be present, or to which either may be readily called at all times. While the work is in progress, copies of permits, approved Shop Drawings, and a complete set of Contract Drawings and Specifications marked up to date with any revisions, shall be kept at said office ready for use at all times.
 2. Provide sturdy furniture, drawing rack, and drawing display table.
 3. All expenses in connection with the field office, including the installation cost, and use of heat, light, water, and janitor service shall be borne by the Contractor.
 4. Field office shall be maintained until final acceptance and then be removed by the Contractor, no later than 15 days after acceptance of building unless the Owner orders earlier removal by them.
- F. Temporary Storage Sheds: Each Subcontractor shall provide and maintain such additional offices, storage sheds, and other temporary buildings or trailers on the project as required for his own use. Location of sheds and trailers shall be located where directed by the Owner.
- G. Sanitary Facilities: Toilet rooms within the new building shall not be used by construction personnel. Provide sanitary facilities that include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures. Install where facilities will best serve the Project. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used materials.
1. Toilets: Install self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. Use of pit-type privies will not be permitted.
 2. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up. Dispose of drainage properly. Supply cleaning compounds.
 3. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units.
- H. First Aid Supplies: Comply with governing regulations.
- I. Fire Extinguishers: Provide hand-carried, portable UL-rated, class 'A' fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, class 'ABC' dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
1. Comply with NFPA 10 and 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- J. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

TEMPORARY FACILITIES AND CONTROLS

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they serve the project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are not longer needed, or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
 - 1. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
- B. Water Service:
 - 1. Sterilization: Sterilize temporary water piping prior to use.
 - 2. Install water service connected to nearest system, and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.
- D. Temporary Lighting:
 - 1. Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
 - 2. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.
- E. Sewers and Drainage:
 - 1. If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

3.4 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
 - 1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Temporary Heat: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
 - 1. The Contractor shall provide heat, supplied with air, as follows:
 - a. At all times during normal working hours, provide sufficient heat to maintain a temperature of not less than 50 degrees F., and from 40 degrees to 50 degrees F. during periods other than specified herein below.
 - b. At all times during the placing, setting, and curing of concrete, provide sufficient heat to ensure heating of the spaces involved to not less than 50 degrees F.
 - c. Well before gypsum board work begins and continuous throughout the setting and drying periods, a temperature range between 55 and 70 degrees F. shall be maintained day and night.
 - 1) During this period, no finish woodwork, wood finish flooring, resilient flooring or flexible wall coverings shall be installed or stored in the buildings, and no finish painting or applying of finish wall coatings shall be undertaken.
 - d. For a period of ten (10) days previous to the placing of interior wood finish and throughout the placing of this and other interior finishing, varnishing, painting, etc., and until final acceptance of the work or until full occupancy by the Owner, provide sufficient heat to produce a temperature of not less than 70 degrees F.
 - e. Heat and air shall be supplied in a manner which shall avoid the rapid drying of material but thoroughly dry to such an extent that no remaining moisture will affect finish material.
 - f. The Contractor shall operate the heating and ventilating systems each day, including Saturdays, Sundays, and holidays; operating shall include necessary labor and approved operating personnel in attendance as required by agencies having jurisdiction.
 - g. It shall be the Contractor's responsibility to coordinate for the range of temperatures required for temporary heating, during this period, that temperature as recommended by the manufacturer of the materials as mentioned are stored in the building or being installed, and for the length of time recommended, following installation.
 - 2. Temporary heating and ventilating equipment, piping, etc., shall be installed in such a manner as not to interfere with work of other trades or the permanent construction.
 - a. If such interference does occur, it shall be the responsibility of the Contractor to make any changes required to overcome the interference.
 - 3. Except as hereinafter specified, the permanent heating and ventilating systems shall not be used for temporary heat.
 - a. The Contractor shall provide, operate, and maintain heating and ventilating units for the purposes specified.

TEMPORARY FACILITIES AND CONTROLS

- b. The units shall be arranged to bring in sufficient outdoor air (min. 1-1/2 air changes per hour) to ventilate the building and to prevent build-up of harmful dusts and fumes and remove excess moisture, especially to prevent damage to built-up roofing.
 - c. During warm weather, the Contractor shall provide an adequate supply of fresh air (min. 1-1/2 air changes per hour) when necessary to properly ventilate for moisture, dust, and fumes from paints, cements, or adhesives in tightly enclosed areas where natural ventilation will not be sufficient.
- C. Temporary Paving: Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period.
 - 1. Locate temporary paving for roads, storage areas, and parking, where the same permanent facilities will be located.
 - 2. Review proposed modifications to permanent paving with the Architect .
- D. Temporary Enclosures: Provide temporary enclosure for protection of construction from exposure, foul weather, other construction operations, and similar activities.
 - 1. Where heat is needed and the building enclosure is incomplete, provide enclosures where there is no other provision for containment of heat.
 - 2. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions.
- E. Project Identification and Temporary Signs:
 - 1. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
 - 2. Prepare project identification and other signs of the size indicated; install signs where indicated to inform the public and persons seeking entrance to the project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.
- F. Temporary Exterior Lighting: Install exterior yard and sign lights so that signs are visible when work is being performed.
- G. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily.
 - 1. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.
 - 2. Do not hold materials more than seven (7) days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F.
 - 3. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly.
 - 4. Dispose of material in a lawful manner.
- H. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
 - 1. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.
- I. Surface and Underground Water Control:
 - 1. Grade site to drain.
 - 2. Maintain excavations free of water.

3. Provide, operate, and maintain pumping equipment.
4. Protect site from puddling or running water.
5. Provide water barriers as required to protect site from soil erosion.
6. Provide dewatering of site as required.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change from use of temporary security and protection facilities to permanent facilities until Substantial Completion.
- B. Fire Protection: Until fire protection is supplied by permanent facilities, install and maintain temporary fire protection of types needed to protect against predictable and controllable fire losses.
 1. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."
- C. Permanent Fire Protection: At the earliest date, complete installation of the permanent fire protection facility, including connected services, and place into operation. Instruct key personnel on use of facilities.
 1. The permanent Fire Protection System shall be operational before any furniture is installed in facility.
- D. Enclosure Fence: Contractor's option, unless otherwise required by the Owner/Contractor Agreement.
- E. Environmental Protection: Operate temporary facilities and conduct construction by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted.
 1. Avoid use of tools and equipment which produce harmful noise.
 2. Restrict use of noise making tools and equipment to hours that will minimize complaints.

3.6 OPERATION:

- A. Enforce strict discipline in use of temporary facilities. Limit availability to intended use to minimize abuse. Maintain facilities in good operating condition until removal.
- B. Protect from damage by freezing temperatures and the elements.
 1. Maintain operation of enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour day basis to achieve indicated results and to avoid damage.
 2. Prevent piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

3.7 TERMINATION AND REMOVAL

- A. Remove each facility when the need has ended, or replaced by a permanent facility, or no later than Substantial Completion.
 - 1. Complete or restore construction delayed because of interference with the facility.
 - 2. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
- B. Temporary facilities are property of the Contractor.
- C. Remove paving that is not acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and fill that does not comply with requirements. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials. Repair or replace street paving, curbs, and sidewalks at the temporary entrances.
- D. At Substantial Completion, renovate permanent facilities used during the construction period, including but not limited to:
 - 1. Replace air filters and clean inside of ductwork and housings.
 - 2. Replace worn parts and parts subject to unusual operating conditions.
 - 3. Replace lamps burned out or noticeably dimmed by substantial hours of use.

- END OF SECTION -

- SECTION 01 5526 -**TRAFFIC REGULATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY (REQUIREMENTS INCLUDED)

- A. Provide, operate and maintain equipment, services and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, on-site access roads, and parking areas.
- B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.

1.3 RELATED REQUIREMENTS

- A. Section 01 5000 "Temporary Facilities and Controls".

1.4 TRAFFIC SIGNALS AND SIGNS

- A. Provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in all areas affected by Contractor's operations. Obtain approval of governmental authorities having jurisdiction.

1.5 FLAGMEN

- A. Provide qualified and suitably equipped flagmen when construction operations encroach on traffic lanes, as required for regulation of traffic.

1.6 FLARES AND LIGHTS

- A. Provide flares and lights during periods of low visibility:
 - 1. To clearly delineate traffic lanes and to guide traffic.
 - 2. For use by flagmen in directing traffic.
- B. Provide illumination of critical traffic and parking areas.

1.7 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.
- B. Monitor parking of construction personnel's private vehicles:
 - 1. Maintain free vehicular access to and through parking areas.
 - 2. Prohibit parking on or adjacent to access roads, or in non-designated areas.

1.8 HAUL ROUTES

- A. Consult with governing authorities and establish approved public thoroughfares which will be used as haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control measures, as approved by governing authorities having jurisdiction, at critical areas of haul routes to expedite traffic flow and to minimize interference with normal public traffic.

1.9 FIRE ACCESS LANES AND ROADS

- A. In order to provide for reasonable fire protection during the construction period, Contractor shall maintain passable vehicular access to all buildings. Coordinate access through locked security gates with Fire Department officials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

- SECTION 01 5800 -**PROJECT IDENTIFICATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. The Contractor shall provide and maintain at the site one project sign.
 - 2. No other signs or advertisements will be allowed to be displayed on the premises.

1.3 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 mph wind velocity.
- B. Sign Painter: Engaged as professional sign painter for not less than three years.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Structure and Framing: New wood, 4 -feet x 4 -feet x 8 -feet treated posts, structurally adequate.
- B. Sign Mounting Board: 4 -feet x 8 -feet, exterior grade, GPX yellow or green plywood with medium density overlay, minimum 3/4 -inch thick.
- C. Rough Hardware: Galvanized, aluminum or brass.
- D. Paint and Primers: Exterior quality, two coats. Color to be White.
- E. Vinyl sign to be provided by Owner and installed by Contractor.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Install project identification sign within 30 days after date fixed by Owner-Contractor Contract.
- B. Erect at designated location as directed by Architect.
- C. Erect supports and framing with uprights 36 inches below surface, braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint sight-exposed surfaces of sign, supports, and framing.

3.2 MAINTENANCE

- A. Maintain signs and supports clean. Repair deterioration and damages.

3.3 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of the Project, when directed by Architect or Owner's Representative and restore the area.

- END OF SECTION -

- SECTION 01 6000 -**PRODUCT REQUIREMENTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Products
 - 2. Transportation and Handling
 - 3. Storage and Protection
 - 4. General Product Requirements

1.3 RELATED REQUIREMENTS

- A. Section 01 2500 "Substitution Procedures"
- B. Section 01 3300 "Submittal Procedures".
- C. Section 01 4000 "Quality Requirements": Product quality monitoring.

1.4 QUALITY ASSURANCE

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B. Provide interchangeable components of the same manufacturer, for components being replaced.

1.5 PRODUCT DELIVERY AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.6 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible.
- B. Store sensitive Products in weather tight, climate controlled enclosures.
- C. For exterior storage of fabricated Products, place on sloped supports, above ground.
- D. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product.
- F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS:

- A. Semi-Open Proprietary Specification Requirements: Where Specifications name one or more products or manufacturers, provide one of the products indicated.
 - 1. Where Specifications specify products or manufacturers by name, accompanied by the term "Approved Substitution", the Architect will allow products as substitutions only after complying with the requirements of the General Conditions and Section 01 3300.
- B. The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
 - 1. **Avendra, LLC Preferred Manufacturers:** Marriott International has negotiated a strategic national pricing/expedited delivery agreement with the listed manufacturers.
 - 2. **Approved Manufacturers:** Products by the listed manufacturers are acceptable for use on this Project, but these manufacturers do not have any strategic agreements with Marriott International.

PART 3 - EXECUTION

Not Used

- END OF SECTION -

- SECTION 01 6116 -

VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Compliance with VOC restrictions for product categories listed below under "DEFINITIONS."
 - 1. Air Pollution Control Rules and Regulations of Maricopa County, Arizona .
 - a. http://www.maricopa.gov/aq/divisions/planning_analysis/adoptedRules.aspx
- B. All products of each category that are installed in the project must comply; applicable laws and ordinances do not allow for partial compliance.
- C. Listing of a product in these specifications shall not be construed as a solicitation or requirement to use any product or combination of products in violation of the requirements of applicable laws.
 - 1. If a listed product in this specification does not meet the requirements of this rule, request approval for use of an alternate product by the same or another manufacturer meeting the requirements of this rule.
 - 2. Do not use products which do not meet the requirements of this rule.

1.3 RELATED REQUIREMENTS

- A. Divisions 01 through 33 contain related requirements specific to the work of each of these Sections. Requirements may or may not include reference to this section.

1.4 DEFINITIONS

- A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site:
 - 1. Adhesives, sealants, and sealer coatings, regardless of specification section or division.
 - 2. Paints and coatings.

- B. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- C. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- D. Other products and processes as required by the referenced Rules and Regulations.

1.5 REFERENCE STANDARDS

- A. Air Pollution Control Rules and Regulations of Maricopa County, Arizona .
 - 1. Rule 335-8807 ARCHITECTURAL COATINGS.
 - 2. Rule 336-9904 SURFACE COATING OPERATIONS.
 - 3. Rule 342-9611 COATING WOOD FURNITURE AND FIXTURES.
 - 4. Rule 346-9611 COATING WOOD MILLWORK.

1.6 SUBMITTALS

- A. See Section 01 3300 "Submittals Procedures".
- B. Evidence of Compliance: Submit for each different product in each applicable category.
 - 1. Identify evidence submittals with the words "Maricopa County VOC Compliance Report".
- C. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
- D. Installer Certifications for Accessory Materials: Require each installer of any type of product, (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.
 - 1. Use the form following this section for installer certifications.

1.7 QUALITY ASSURANCE

- A. A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide only products having volatile organic compound (VOC) content not greater than required by Air Pollution Control Rules and Regulations of Maricopa County, Arizona and less where required by code.
 - 1. These products may be specified in multiple sections throughout these specifications.
- B. Adhesives, including carpet: Comply with Rule 336-9904 SURFACE COATING OPERATIONS.

VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS

1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
- C. Joint Sealants: Comply with Rule 336-9904 SURFACE COATING OPERATIONS.
 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
- D. Aerosol Adhesives: Comply with Rule 336-9904 SURFACE COATING OPERATIONS.
 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current GreenSeal Certification.
 - b. Report of laboratory testing performed in accordance with GreenSeal GS-36 requirements.
 - c. Published product data showing compliance with requirements.
- E. Paints and Coatings:
 1. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
 - a. Evidence of Compliance: Acceptable types of evidence are:
 - 1) Report of laboratory testing performed in accordance with requirements.
 - 2) Published product data showing compliance with requirements.
 - 3) Certification by manufacturer that product complies with requirements.
 2. Provide coatings that comply with the most stringent appropriate requirements specified in the following:
 - a. Rule 335-8807 ARCHITECTURAL COATINGS.
 - b. Rule 336-9904 SURFACE COATING OPERATIONS.
 - c. Rule 342-9611 COATING WOOD FURNITURE AND FIXTURES.
 - d. Rule 346-9611 COATING WOOD MILLWORK.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. All additional costs to restore indoor air quality, including fines by authorities, due to installation of non-compliant products will be borne by Contractor.

3.2 RESTRICTED COMPONENTS

- A. Restricted Components:
1. Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.
- B. The following tables are taken from Air Pollution Control Rules and Regulations of Maricopa County, Arizona which are incorporated in entirety by reference. All products used shall comply with these limits.

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Rule 335 ARCHITECTURAL COATINGS

<u>COATING</u>	<u>Effective Dates</u>		
	7/13/89	7/13/90	7/13/91 (lb/gal)
Concrete Curing Compounds	-	-	2.9
Dry Fog Coating			
Flat	4.6	-	3.5
Non-flat	3.5	-	3.3
Enamel Undercoaters	3.8	-	2.9
General Primers, Sealers and Undercoaters	3.3	-	2.9
Industrial Maintenance Primers and Topcoats			
Alkyds	4.2	3.5	3.5
Catalyzed Epoxy	-	4.2	3.5
Bituminous Coating			
Materials	-	-	3.5
Inorganic Polymers	-	-	3.5
Vinyl Chloride Polymers	-	-	3.5
Chlorinated Rubbers	-	-	3.5
Acrylic Polymers	-	3.5	3.5
Urethane Polymers	-	3.5	3.5
Silicones	-	-	3.5
Unique Vehicles	-	-	3.5
Lacquers	-	-	5.7
Opaque Stains	3.3	-	2.9
Wood Preservatives	-	-	2.9
Quick Dry Enamels	-	-	3.3
Roof Coatings	-	-	2.5
Semi-transparent Stains	-	-	2.9
Semi-transparent and Clear Wood Preservatives	-	-	2.9
Opaque Wood Preservatives	3.3	-	2.9
Specialty Flat Products	-	-	3.3
Specialty Primers, Sealers & Undercoaters	-	-	2.9
<i>Stains, All</i>	-	-	2.9
Traffic Coatings			
Applied to Public Streets and Highways	3.5	-	2.1
Applied to other Surfaces	2.1	-	2.1
Black Traffic Coatings	-	-	2.1
Varnishes	-	4.2	2.9
Waterproof Mastic Coating	-	-	2.5
Waterproof Sealers	-	-	3.3
<i>Wood Preservatives Except Below Ground</i>	-	-	2.9

² This note is not part of Rule 335. For the reader's convenience, words in italics are not part of this Rule 335, but are alphabetized repeats of listed coatings.

Rule 336 SURFACE COATING OPERATIONS

TABLE 1

SURFACE COATING EMISSION LIMITS		
TYPE OF SURFACE COATING Column I	LIMITS AS APPLIED: VOC content minus exempt compounds (see subsection 255.1)	
	Column II lbs/gal	g/liter
Can Coating		
Sheet Basecoat (Exterior and Interior) and Overvarnish	2.8	340
Two-Piece Can Exterior (Basecoat and Overvarnish)	2.8	340
Two and Three-Piece Can Interior Body Spray	4.2	510
Two-Piece Can Exterior End (Spray or Roll Coat)	4.2	510
Three-Piece Can Side-Seam Spray	5.5	660
End Sealing Compound	3.7	440
Can Printing Ink	2.5	300
Coil Coating (any coat)	2.6	310
Metal Furniture Coating	3.0	360
Large Appliance Coating	2.8	340
OTHER METAL PARTS AND PRODUCTS COATING (As defined in Section 231)		
The following includes Non-adhesive Coating, Adhesive, Adhesive Primer, Caulking, and Beaded Sealants:		
Air-Dried Coating	3.5	420
Baked Coating [above 200°F (93°C)]	3.0	360
Silicone Release Coating: Baked or Air-Dried	3.5	420
Fabric Coating	2.9	350
Film Coating	2.9	350
COATING PLASTIC PARTS AND PRODUCTS THAT ARE Not Defined as Flexible	3.5	420
COATING FLEXIBLE PLASTIC PARTS AND PRODUCTS		
Primer	4.1	490
Color Topcoat	3.8	450
Basecoat/Clear Coat (Combined System) – Limit for either coat	4.5	540
Paper Coating, including Adhesives	2.9	350
Vinyl Coating (Coating on Vinyl)	3.8	450
STRIPPABLE BOOTH COATINGS	2.0	240

Rule 342 COATING WOOD FURNITURE AND FIXTURES**301 LIMITATIONS – VOC CONTENT:**

301.1 No person shall apply a topcoat or sealer to wood furniture or fixtures unless VOC content is limited either to the pounds of VOC per pound of solids (kg VOC/kg solids) in Column A or to the grams of VOC per liter in column B:

a. General VOC Limits of Coatings

Table 1

	Column A <u>lb VOC/lb solids</u>	Column B <u>grams VOC/liter **</u>
Topcoat	1.8	635
Sealer	1.9	645
Acid-cured, alkyd amino topcoat	2.0	655
Acid-cured, alkyd amino vinyl sealer	2.3	680
		**less non-precursor compounds & water

- b. Option: Lower VOC topcoat and unlimited sealer:** There is no VOC limit on sealer when the sealer's topcoat does not exceed 0.8 lb VOC/lb (0.8 kg/kg).
- c. Coatings with no VOC limits:** Stains, washcoats, glazes, toners, inks, and other coatings not specified in this subsection 301.1 nor in subsection 301.2 have no VOC limits.

Rule 346 COATING WOOD MILLWORK

301 VOC CONTENT:

301.1 Coating VOC Limits: No person shall apply topcoats, sealers or opaque coatings to wood-product surfaces on millwork unless VOC content is limited to the following, less water and non-precursor organic compounds:

a. General VOC Limits of Coatings

<u>CATEGORY</u>	grams/liter	lbs/gal
Non-opaque topcoat	635	5.29
Non-opaque sealer	645	5.38
Non-opaque acid-cured, alkyd amino topcoat	655	5.45
Non-opaque acid-cured, alkyd amino vinyl sealer	680	5.66
Opaque: Topcoat, Sealer, Primer, Groundcoat, Basecoat, or Stain	610	5.10

– END OF SECTION –

Installer Certification Form Follows

ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM**FORM**

Identification:

1. Project Name: _____
2. Project No.: _____
3. Architect: _____

Use of This Form:

1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
2. Contractor is required to obtain and submit this form from each installer of work on this project.
3. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
4. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

VOC content restrictions are specified in Section 01-6116.

PRODUCT CERTIFICATION

I certify that the installation work of my firm on this project:

5. [HAS] [HAS NOT] required the use of any ADHESIVES.
6. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
7. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.

Product data and MSDS sheets are attached.

CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

Firm Name: _____

Print Name: _____

Signature: _____

Title: _____ (officer of company)

Date: _____

- SECTION 01 7123 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Quality Assurance
 - 2. Submittals
 - 3. Project Record Documents
 - 4. Survey Requirements
 - 5. Examination
 - 6. Survey Reference Points

1.3 RELATED REQUIREMENTS

- A. General Conditions: Basic site engineering requirements.
- B. Section 01 7700 - Contract Closeout: Project Record Documents.
- C. Section 02 3200 "Subsurface Investigation" for Owner's topographic survey/ geotechnical Report reference.
- D. Section 02 4116 "Structure Demolition"

1.4 QUALITY ASSURANCE

- A. Employ a Land Surveyor or Engineer registered in the State where project is located and acceptable to the Owner and Architect, to perform survey work of this section.
- B. Submit evidence of Surveyor's or Engineer's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.5 SUBMITTALS

- A. Submit a copy of registered site drawing and a certificate signed by the Land Surveyor or Engineer, that the elevations and locations of the Work are in conformance with Contract Documents.
- B. On request, submit documentation verifying accuracy of survey work.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain a complete and accurate log of control and survey work as it progresses.
- B. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

1.7 SURVEY REQUIREMENTS

- A. Provide field engineering services. Utilize recognized engineering survey practices.
- B. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- C. Submit Project Record Documents under provisions of Section 01 7839.
- D. Establish elevations, lines and levels.
 - 1. Locate and lay out by instrumentation and similar appropriate means.
- E. Periodically verify layouts by same means

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify locations of survey control points prior to starting work.
 - 1. Verify set-backs and easements, confirm drawing dimensions and elevations.
- B. Promptly notify Architect of any discrepancies discovered.

3.2 SURVEY REFERENCE POINTS

- A. Contractor to locate and protect survey control and reference points.
- B. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- C. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- D. Replace dislocated survey control points based on original survey control.
 - 1. Make no changes without prior written notice to Architect.

- END OF SECTION -

- SECTION 01 7300 -**EXECUTION REQUIREMENTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Special Provisions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
 - 10. Shoring.
 - 11. Below grade waterproofing.

1.3 RELATED REQUIREMENTS

- A. Section 01 3100 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
- B. Section 01 7400 "Cleaning and Construction Waste Management".
- C. Section 01 7700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
- D. Section 02 4116 "Structure Demolition" for demolition and removal of buildings, below grade construction, selected site infrastructure and underground utilities.
- E. Section 07 8413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by land surveyor.
- E. Final Property Survey: Submit five copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.

EXECUTION REQUIREMENTS

- c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS (NOT USED)

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Section 01 8113 "Sustainable Design Requirements"
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on "Request for Information/ Interpretation Form ".

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Owner's Representative promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

EXECUTION REQUIREMENTS

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect and Owner's Representative when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Owner's Representative.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of **96 -inches (2440 mm)** in occupied spaces and **90 -inches (2300 mm)** in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.

EXECUTION REQUIREMENTS

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 1000 "Summary of Work."
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.

- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

EXECUTION REQUIREMENTS

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted. Comply with waste disposal requirements in Section 01 7400 "Cleaning and Waste Management".
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 7329 "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

- END OF SECTION -

- SECTION 01 7329 -**CUTTING AND PATCHING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Administrative and Procedural Requirements for Cutting and Patching

1.3 RELATED REQUIREMENTS

- A. Section 02 4116 "Structure Demolition"
- B. Refer to other Sections of these Specifications, including Divisions 22 through 28, for specific requirements and limitations applicable to cutting and patching individual parts of the work.

1.4 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

- A. CUTTING AND PATCHING PROPOSAL:
 - 1. Where approval of procedures is required before proceeding, submit a proposal describing procedures in advance of the time cutting and patching will be performed. Include the following information, as applicable:
 - a. Describe the extent of cutting and patching required and how it is to be performed. Indicate why it cannot be avoided.
 - b. Describe anticipated results, include changes to structural elements and operating components and changes in the building's appearance and other visual elements.
 - c. List products to be used and entities that will perform work.
 - d. Indicate dates when cutting and patching is to be performed.

- e. List utilities that will be disturbed, including those that will be relocated and those that will be temporarily out-of service. Indicate how long service will be disrupted.
- f. Approval by the Architect to proceed does not waive the Architect right to later require complete removal and replacement of work found to be unsatisfactory.

1.6 STRUCTURAL WORK:

- A. Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load deflection ratio. Obtain approval of the cutting and patching proposal before cutting and patching structural elements.

1.7 OPERATIONAL AND SAFETY LIMITATIONS:

- A. Do not cut and patch operating elements or safety components in a manner that would reduce their capacity to perform as intended, or would increase maintenance, or decrease operational life or safety. Obtain approval of the cutting and patching proposal before cutting and patching operating elements or safety related systems.

1.8 VISUAL REQUIREMENTS:

- A. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would reduce the building's aesthetic qualities or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Use materials identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible. Use materials whose performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Before cutting, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed.
 - 1. Take corrective action before proceeding if unsafe or unsatisfactory conditions are encountered.

3.2 PREPARATION:

- A. Provide temporary support of work to be cut.

CUTTING AND PATCHING

3.3 CLEANING:

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove paint, mortar, oils, putty and similar items. Thoroughly clean piping, conduit, and similar features before painting or finishing is applied. Restore damaged pipe covering to its original condition.

3.4 PROTECTION:

- A. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions that might be exposed during cutting and patching operations.
- B. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- C. Take all precautions to avoid cutting existing pipe, conduit, or ductwork serving the building, but scheduled to be removed, or relocated until provisions have been made to bypass them.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems, when possible, before cutting to minimize interruption to occupied areas.

3.5 PERFORMANCE:

- A. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
- B. Cut existing construction to provide for the installation of other components or the performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

3.6 CUTTING:

- A. All cutting of areas shall be by Contractor requiring cutting, except where noted otherwise in the Specifications and/or Drawings.
- B. Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible, review procedures with the original installer. Comply with the original installer's recommendations.
- C. Where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
- D. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill. Overcuts are **NOT** allowed
 - 1. At concrete slabs on grade cut existing vapor barrier leaving 6-inches of existing vapor barrier material on each side of cut for splicing in new vapor barrier material.

- E. Comply with requirements of applicable sections of Division 02 where cutting and patching requires excavating and backfilling.

3.7 PATCHING:

- A. All patching shall be provided by Contractor doing cutting work and shall be performed by trade who would customarily be performing that type of work.
- B. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
- C. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - 1. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch, after the patched area has received primer and second coat.
 - 2. Patch, point or grout flush all voids, holes, chips, cracks, spalls, broken or otherwise damaged surfaces. Patch with materials which match adjacent surfaces in appearance and quality
- D. Repair surfaces exposed by removed finishes, fixtures, or equipment.

- END OF SECTION -

- SECTION 01 7400 -**CLEANING AND CONSTRUCTION WASTE
MANAGEMENT**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Throughout all phases and items of the construction period, maintain the building and site in a standard of cleanliness as described in this Section including:
 - a. Cleaning Materials and Equipment
 - b. Progress Cleaning
 - c. Final Cleaning

1.3 RELATED REQUIREMENTS

- A. General Conditions.
- B. In addition to standards described in this Section, comply with all requirements for cleaning-up as described in various other Sections of these Specifications.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 QUALITY ASSURANCE

- A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met
- B. Codes and Standards: In addition to the standards described in this Section, comply with all pertinent requirements of Governmental agencies having jurisdiction.

- C. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems or into streams or waterways is not permitted.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

- A. Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

- A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Owner's Representative.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

- A. General:
1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection of materials.
 2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for the construction of this work.
 3. Twice weekly, and more often if necessary, the Contractor shall completely remove all scrap, debris, and waste material from the job site, and shall place into container furnished by the Contractor.
 4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection.
- B. Project Site; The Contractor shall:
1. Daily, and more often if necessary, inspect the project site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
 2. Weekly, and more often if necessary, sweep all interior places clean. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by reasonable diligence using a hand-held broom.
 3. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.
 4. Following the installation of finish floor materials, protect by covering with temporary coverings and/or clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials have been installed. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from all foreign material, which may be injurious to the finish floor material.

3.2 FINAL CLEANING

- A. Definition: Except as otherwise specifically provided, "Clean" (for the purpose of this Article) shall be interpreted as meaning the level of cleanliness generally provided by commercial building maintenance Subcontractors using commercial quality building maintenance equipment and materials.
- B. General: Prior to completion of the work, remove from the job site all tools, temporary structures, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in [Article 3.1](#) above.
- C. Interior: Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains, and dirt from finished surfaces. Use only the specified cleaning materials and equipment.
- D. Repair, patch, and touch-up marred or damaged surfaces to match adjacent finishes.
- E. Clean the following if located within the project area:
 - 1. Plumbing Fixtures, Strainers and Floor Drains
 - 2. Light Fixtures and Lamps
 - 3. Replace filters of ventilating equipment when units have been operating during construction. In addition, clean grilles and louvers.
 - 4. Excess lubrication is to be removed from mechanical and electrical equipment.
 - 5. All Electrical Panels
- F. Clean all transparent materials, including glass and mirrors. Remove glazing compound and other substances that are noticeable from vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
- G. Remove labels that are not permanent labels.
- H. Polished and Resilient Surfaces: To all surfaces requiring the routine application of protective waxes and/or buffed polish, apply the specified coating and/or polish as recommended by the manufacturer of the material being treated, as specified in individual Specification Sections.
- I. Leave concrete floors broom clean. Vacuum carpeted surfaces.
- J. Clean areas traversed by construction personnel.
- K. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean. Remove stains, spills, and other foreign deposits.
- L. Maintain cleaning until the building, or portion thereof, is accepted by the Owner.

- END OF SECTION -

- SECTION 01 7700 -

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.3 RELATED REQUIREMENTS:

- A. Section 01 3233 "Photographic Documentation" for submitting final completion construction photographic documentation.
- B. Section 01 7300 "Execution Requirements" for progress cleaning of Project site.
- C. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
- D. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
- E. Section 01 7900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.4 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit sustainable design submittals required in Section 01 8113 and in individual Sections.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

CLOSEOUT PROCEDURES

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 7900 "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 2900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled

requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

CLOSEOUT PROCEDURES

- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 5000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in related section.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
- 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

- END OF SECTION -

CLOSEOUT PROCEDURES

- SECTION 01 7813 -**BOINDS AND WARRANTIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. This Section specifies general administrative and procedural requirements for warranties, guarantees, and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - a. Warranties required by the Specifications, Divisions 02 through 33, shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to other warranties made by the Contractor under the Contract Documents.
 - 2. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

1.3 RELATED REQUIREMENTS

- A. Additional requirements as specified in General Conditions.
- B. General closeout requirements are included in Section 01 7700 Contract Closeout.
- C. Warranties, including requirements for certifications for the work and products and installation that are specified to be warranted, are stated in the individual Specification Sections of Divisions 02 through 33.
- D. Specific certification requirements and other commitments and agreements for continuing services to the Owner are specified elsewhere in the Contract Documents.

1.4 DEFINITIONS

- A. Categories of Specific Warranties: Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific

categories related to individual units of work specified in sections of Divisions 02 through 33 of these Specifications.

1. Special Project Warranty (Guarantee): A warranty specifically written and signed by Contractor for a defined portion of the Work and, where required, countersigned by Subcontractor, installer, manufacturer, or other entity engaged by Contractor.
2. Specified Product Warranty: A warranty which is required by Contract Documents, to be provided for a manufactured product incorporated into the Work, regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of product into the Work, or has written and executed a special project warranty as a direct result of Contract Documents requirements.
3. Coincidental Product Warranty: A warranty which is not specifically required by Contract Documents (other than as specified in this Section), but which is available on a product incorporated into the work by virtue of the fact that manufacturer of product has published warranty in connection with purchases and uses of product without regard for specific applications, except as otherwise limited by terms of warranty.

1.5 SUBMITTALS

- A. If the date of Substantial Completion designates a commencement date for warranties other than the proposed date of Substantial Completion for the Work, or a designated portion of the Work, the Contractor shall submit written warranties upon request of the Owner, in accordance with this Section.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, properly executed warranties should be submitted to the Owner within 15 days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, a written document should be prepared which contains appropriate terms and identification, ready for execution by the required parties. Draft copies should be submitted for approval prior to final execution.
- D. Refer to individual Sections of Divisions 02 through 33 for specific content requirements, and particular requirements for submittal of special warranties.
- E. Final Form of Submittal: Prior to certification for Substantial Completion, compile two original copies of each approved warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Specifications.
 1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders.
- F. Provide additional photocopies of each warranty for inclusion in the appropriate volume of the Operating and Maintenance Manuals.

1.6 QUALITY ASSURANCE

- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

1.7 WARRANTY REQUIREMENTS

- A. Conform to General Conditions, Article 37, and the following:
1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
 2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with date of revised warranty beginning from date of repair.
 3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents.
 - a. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- B. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- C. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- D. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- E. In the event that the Owner or any of its agents takes possession of the Work or any portion thereof, pursuant to the Contract Provisions, warranties shall not start until such work, or portions thereof, are separately and finally accepted.
1. Warranty coverage for system components shall not become effective until the Owner makes final acceptance of the system or a separate portion of the system containing the component.
 2. All affected warranties shall continue in force for a period of at least one (1) year from the date of final acceptance of the work or any portion thereof.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

NOT USED

- END OF SECTION -

- SECTION 01 7823 -**OPERATION AND MAINTENANCE DATA**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. This Section specifies the administrative requirements, procedural obligations, terms and conditions and general requirements related to the preparation and submittal of instruction manuals covering the materials installed, care, preservation and maintenance of products, finishes, equipment and systems.

1.3 RELATED REQUIREMENTS

- A. Section 01 3300, "Submittals and Substitutions" for Preparation of Shop Drawings and Product Data.
- B. Section 01 7700, "Contract Closeout" for General closeout requirements.
- C. Section 01 7839, "Project Record Documents" for General requirements for submittal of Project Record Documents.
- D. Specifications Sections of Divisions 02 through 33 for Special operating and maintenance data requirements for specific equipment or building operating systems are included in the appropriate.

1.4 SUBMITTALS

- A. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals:
 - 1. Submit two (2) copies of the first and subsequent drafts of each manual for review. Include a complete index and table of contents for each volume. One (1) copy will be returned within 45 days of receipt with comments. The first draft shall be at least 95% complete. Provide FINAL manuals prior to commencement of training; these manuals shall be utilized as instructional text during the building orientation and training processes.
 - a. Refer to Section 01 7839 "Project Record Documents".

- B. Form of Submittal: Manuals should be prepared in the form of an instructional manual for use by the Owner's operating personnel and/or property management company. The information should be bound as follows:
1. Binders: For each manual, provide heavy-gauge, commercial quality, vinyl hanging VUE presentation binders in 3 -inch capacity sized to receive 8-1/2 -inch by 11 -inch paper. Binder color shall be white.
 - a. Identify each binder on the spine with the typed or printed title "OPERATION AND MAINTENANCE MANUAL", project name and subject matter covered.
 2. Indicate the volume number for multiple volume sets of manuals.
 3. Dividers: Manual contents shall be organized and divided by specification divisions using index maker dividers.
 4. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
 5. Text Material: Where written material is required as part of the manual, use the manufacturer's standard printed material.
 6. Drawings: Where drawings or diagrams are required as part of the manual, provide protective plastic jackets for the drawings and bind in with the text.

1.5 GENERAL MANUAL CONTENT

- A. In each manual, include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:
1. General system or equipment description.
 2. Design factors and assumptions.
 3. Copies of approved shop drawings, product data, installation instructions and setup/calibration procedures.
 4. Load and performance testing reports including equipment and system startup/performance documentation.
 5. Fire/flame spread test certificates.
 6. System or equipment identification, including:
 - a. Name of manufacturer
 - b. Model number
 - c. Serial number
 7. Standard operating instructions.
 8. Emergency operating instructions.
 9. Wiring diagrams including color coding, labeling and terminal designations.
 10. Inspection and test procedures.
 11. Detailed preventative maintenance procedures, frequencies and special tool requirements.
 12. Operator trouble-shooting guide.
 13. Precautions against improper use and maintenance.
 14. Copies of warranties, including extended warranty options.
 15. General owners operating/service manual.
 16. Factory service manuals, including repair instructions and illustrated parts listing.
 17. Electronic copies of operating system software (3.5 in. diskettes or CD-ROM).
 18. Material safety data sheets.

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19. Sources of required maintenance materials repair/replacement parts and related services.
 20. Copies of inspections and certifications by governing authorities.
- B. Manual Index: Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of Product Data, supplemented by drawings and written text, and copies of each warranty, bond and service contract proposal.
- C. Title Page: Provide a title page as the first sheet of each manual. Provide the following information.
1. Subject matter covered by the manual.
 2. Name and number of the Contract.
 3. Date of submittal.
 4. Name, address, and telephone number of the Contractor and Subcontractor.
 5. Name and address of the Architect/Engineer.
 6. Cross reference to related systems in other operating and maintenance manuals.
- D. General Table of Contents: After the Title Page, include a typewritten table of contents for each volume (Divisions 02 through 33 inclusive), arranged according to the specification format.
- E. General Information: Provide a general information Section immediately following the Table of Contents, listing by Specification Section each major product included in the manual, identified by product name. Under each product, list the name, address, telephone number, and point of contact of the Subcontractor or installer, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.
- F. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation and delete references to information that is not applicable.
1. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:
 - a. Manufacturer's Catalog Number
 - b. Size
 - c. Material Composition
 - d. Color
 - e. Texture
 - f. Re-ordering Information for Specially Manufactured Products
 2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information regarding cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

3. Color Schedules: Provide information showing manufacturer's color name and catalog number for all exposed finishes, including paint, carpet, wallcoverings, and other finish materials.
 4. Moisture-Protection and Weather-Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture-protection purposes.
 - a. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:
 - 1) Applicable standards
 - 2) Chemical composition
 - 3) Installation details
 - 4) Inspection procedures
 - 5) Maintenance information
 - 6) Repair procedures
- G. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.
1. Description: Provide a complete description of each unit and related component parts, including the following:
 - a. Equipment or system function
 - b. Operating characteristics
 - c. Limiting conditions
 - d. Performance curves
 - e. Engineering data and tests
 - f. Complete nomenclatures and number of replacement parts
 2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment, provide the following:
 - a. Printed operating and maintenance instructions.
 - b. Assembly drawings and diagrams required for maintenance.
 - c. Recommended parts inventory listing.
 3. Provide information detailing essential maintenance procedures, including the following:
 - a. Routine operations
 - b. Trouble-shooting guide
 - c. Disassembly, repair and reassembly
 - d. Alignment, adjusting and checking
 4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:
 - a. Start-up procedures
 - b. Equipment or system break-in
 - c. Routine and normal operating instructions
 - d. Regulation and control procedures
 - e. Instructions on stopping
 - f. Shut-down and emergency instructions
 - g. Day and night operating instructions
 - h. Summer and winter operating instructions

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- i. Required sequences for pneumatic, electric, electronic or direct digital control systems
 - j. Special operating instructions
- 5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.
- 6. Controls: Provide a comprehensive description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.
- 7. Drawings: Provide copies of each Contractor/Subcontractor set of coordination drawings.
- 8. Valve Tags: Provide charts of valve tag numbers with the room number location and function of each valve. Valve tag locations shall be clearly indicated on the set of record "As-Built" drawings.
- 9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including the following:
 - a. Electric power
 - b. Lighting
 - c. Communications
 - d. Fire Alarm

- H. Written Test: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure.
- I. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation. Do not use original Project Record Documents as part of the Operating and Maintenance Manuals.
- J. Warranties, Bonds, and Service Contracts: Provide a photocopy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure including the return policies/procedures. List circumstances and conditions that would affect validity of the warranty or bond. Commencement and expiration dates shall be clearly indicated.
- K. Provide complete information in the manual on products specified in Divisions 02 through 33.

1.6 TRAINING OF OPERATING AND MAINTENANCE PERSONNEL

- A. Prior to final inspection, instruct the hotel personnel in operation, adjustment, and maintenance of products, equipment and systems.
 - 1. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.
 - 2. Refer to Specification Section 01 7900, "Demonstration and Training", for detailed training requirements

1.7 OPERATING MAINTENANCE MANUALS

- A. Submit copies of each manual, in the form specified, to the Architect for distribution.
 - 1. Refer to individual Specification Sections and other paragraphs within this Section for additional requirements.
- B. Manuals should be organized into separate and distinct volumes (binders) as described hereafter:
 - 1. "SITE WORK"
 - a. Asphalt Concrete Pavement
 - b. Tack and Prime Coat
 - c. Concrete Curbs and Sidewalks
 - d. Pavement Markings
 - e. Guide Rail
 - f. Termite Control
 - g. Traffic Signage
 - 2. "SITE WORK UTILITIES"
 - a. Water and Sanitary Sewer Facilities
 - b. Drainage Structures
 - c. Underdrains
 - d. Electrical Power Service
 - e. Gas Utility
 - 3. "Landscape and Site Improvements"
 - a. Soil Preparation and Seeding
 - b. Trees, Plants, and Ground Cover
 - c. Fences and Gates
 - d. Playfields and Equipment
 - e. Site and Street Furnishings
 - 4. "BUILDINGS AND STRUCTURES"
 - a. Concrete
 - b. Unit Masonry
 - c. Metals
 - d. Woods and Plastics
 - e. Thermal and Moisture Protection
 - f. Doors and Windows
 - g. Finishes
 - h. Specialties
 - i. Fixtures, Furnishings, and Equipment
 - 5. "WAYFINDING"
 - a. Exterior Signage
 - b. Exterior Post/Panel and Overhead Panel Signs
 - 6. "SWIMMING POOLS AND SPAS"
 - a. Basic Piping and Pumps
 - b. Filtering and Deck Equipment

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- c. Pool Heater and Controls
 - d. Chemical Treatment
- 7. "TRACTION ELEVATORS"
- 8. "HYDRAULIC ELEVATORS"
- 9. "MECHANICAL, HVAC"
 - a. Basic Materials and Methods
 - b. Piping and Specialties
 - c. Insulation
 - d. Pumping
 - e. Refrigeration
 - f. Air Handling and Distribution
 - g. Automatic Temperature Control
 - h. Testing/Adjusting/Balancing
- 10. "MECHANICAL, PLUMBING"
 - a. Basic Materials and Methods
 - b. Piping and Specialties
 - c. Insulation
 - d. Fixtures/Trim/Accessories
 - e. Water Heaters
 - f. In-Line Circulating Pumps
 - g. Water Softening Equipment
- 11. "FIRE SPRINKLERS"
 - a. Basic Materials and Methods
 - b. Standpipe and Hose Systems
 - c. Fire Pumps
 - d. Dry Pipe Sprinkler Systems
 - e. Wet Pipe Sprinkler Systems
- 12. "ELECTRICAL"
 - a. Basic Materials and Methods
 - b. Service and Distribution
 - 1) Service Entrance
 - 2) Switchboards
 - 3) Disconnects
 - 4) Grounding
 - 5) Transformers
 - 6) Panelboards
 - 7) Overcurrent Protective Devices
 - 8) Contactors
 - 9) Voltage Surge Suppression
 - 10) Heat Tracing
 - c. Lighting
 - 1) Interior and Exterior Luminaries, Lamps and Accessories
 - 2) Emergency Lighting

- 3) Lighting Control Equipment
- 13. "SOUND SYSTEMS"
- 14. "COMMUNICATIONS"
 - a. Voice and Data
 - b. Television Distribution System
 - c. Security Intercom System
- 15. "FIRE ALARM SYSTEM"

1.8 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store Record Documents and Samples in the field office apart from Contract Documents used for construction.
 - 1. Do not permit Project Record Documents to be used for construction purposes.
 - 2. Maintain Record Documents in good order and in a clean, dry, legible condition.
 - 3. Make Documents and Samples available at all times for inspection by the Owner's Representative or Architect.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

- END OF SECTION -

- SECTION 01 7839 -**PROJECT RECORD DOCUMENTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. This Section specifies administrative and procedural requirements for Project Record Documents to be prepared and submitted by the General Contractor.
 - 2. Project Record Documents required include:
 - a. Marked-Up Copies of Record Drawings, Specifications, and Product Data
 - b. Record Samples
 - c. Miscellaneous Record Submittals

1.3 RELATED REQUIREMENTS

- A. Section 01 7700 "Contract Closeout" for general project closeout requirements
- B. Section 01 3300 "Submittals and Substitutions," for general requirements for submittal of Shop Drawings and Product Data.
- C. Section 01 7823 "Operation and Maintenance Data" for operating and maintenance data.
- D. Sections of Divisions 02 through 33 for specific record copy requirements that expand requirements of this Section.

1.4 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Refer to General Conditions, Article 17.

1.5 RECORD DRAWINGS

- A. The Contractor shall maintain a white-print set (blue-line or black-line) of Contract Drawings and Shop Drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where Shop Drawings are used for

mark-up, record a cross reference at corresponding location on working drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either Contract Drawings or Shop Drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date. Note related change order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on cover of each set.

- B. Responsibility for Markup: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, Subcontractor, or similar entity, is required to prepare the mark-up on Record Drawings.
- C. At time of Substantial Completion, submit Record Drawings to Owner for Owner's records in accordance with General Conditions, Article 17.
 - 1. Refer to Section 01 7823 for items to be included in manuals.
 - 2. Three (3) copies will be required.

1.6 RECORD SPECIFICATIONS

- A. The Contractor shall maintain one copy of specifications, including addenda, change orders, and similar modifications issued in printed form during construction, and mark-up variations (of substance) in actual work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of option, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable. Upon completion of mark-up, submit to [Architect](#).
- B. The Contractor is responsible for collecting marked-up record Sections from each of the other Subcontractors, and for collating these Sections in proper numeric order with its own Sections to form a complete set of record Specifications. Submit to the Owner.
- C. Three (3) copies will be required.

1.7 PRODUCT DATA

- A. During the construction period, maintain one copy of each Product Data submittal for Project Record Document purposes.
 - 1. Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submitted. Include significant changes in the product delivered to the site and changes in manufacturer's instructions and recommendations for installation.
 - 2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 3. Note related Change Orders and mark-up of Record Drawings, where applicable.
 - 4. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as record Product Data. Refer to Section 01 78 23 (01830) for requirements. Submit to the Owner.
 - 5. The Contractor is responsible for mark-up and submittal of record Product Data.

1.8 SAMPLES

- A. Immediately prior to date of Substantial Completion, the Contractor shall meet with the Owner at the site to determine which of the Samples maintained during the construction period shall be transmitted to the Owner for record purposes. Comply with the Owner's instructions for packaging, identification marking, and delivery to Owner's storage space. Dispose of other Samples in manner specified for disposal of surplus and waste materials.

1.9 MISCELLANEOUS RECORD SUBMITTALS

- A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Owner.
1. Categories of requirements resulting in miscellaneous records include, but are not limited to, the following:
 2. Field Records on Excavations and Foundations
 3. Field Records on Underground Construction and Similar Work
 4. Survey Showing Locations and Elevations of Underground Lines
 5. Invert Elevations of Drainage Piping
 6. Surveys Establishing Building Lines and Levels
 7. Authorized Measurements Utilizing Unit Prices or Allowances
 8. Batch Mixing and Bulk Delivery Records
 9. Load and Performance Testing
 10. Inspections and Certifications by Governing Authorities
 11. Leakage and Water-Penetration Tests
 12. Fire Resistance and Flame Spread Test Results
 13. Final Inspection and Correction Procedures

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION**3.1 RECORDING**

- A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

- END OF SECTION -

- SECTION 01 7843 -

SPARE PARTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Spare Parts and Materials

1.3 RELATED REQUIREMENTS

- A. Refer to individual sections for items listed herein, as well as other requirements.
- B. Refer to Drawings.

PART 2 - PRODUCTS

2.1 EXTRA MATERIALS - GENERAL

- A. At the time of building acceptance, deliver to the Owner the following extra materials.
 - 1. Refer to specific specification sections.
 - 2. Deliver in original unopened cartons or containers (except paint) with each item properly identified.
 - 3. Deliver for the following sections listed in this Article, but not limited to.

2.2 THIN BRICK (04 2115)

- A. Furnish extra thin brick materials from same production run as the materials applied in the quantities described below. Package materials in unopened boxes designed for brick with labels describing contents.
 - 1. Quantity: Furnish 50 thin brick components of each type and color installed.

2.3 EXTERIOR STONE CLADDING (04 4200)

- A. Furnish extra stone cladding materials from same production run as the materials applied in the quantities described below. Package materials in boxes designed for stone with labels describing contents.
 - 1. Quantity: Refer to Section 04 4200

2.4 WATER REPELLENT AND GRAFFITI RESISTANT COATINGS (07 1900)

- A. Furnish extra materials from same production run as the materials applied in the quantities described below.
 - 1. Quantity: Furnish one gallon of each type applied.

2.5 JOINT SEALANTS (07 9200) (INTERIOR)

- A. Furnish extra sealant materials from same production run as the materials applied in the quantities described below. Package materials in unopened, factory-sealed containers with labels describing contents.
 - 1. Quantity: Refer to Section 07 9200. Furnish one unused tube of each type and color of interior sealant applied.

2.6 EXTERIOR FAÇADE JOINT SEALANTS (07 9213)

- A. Furnish extra sealant materials from same production run as the materials applied in the quantities described below. Package materials in unopened, factory-sealed containers with labels describing contents.
 - 1. Quantity: Refer to Section 07 9213.

2.7 TILING (09 3013)

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to one case for each type, composition, color, pattern, and size indicated.

2.8 EXTERIOR TILING (09 3053)

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units: Refer to Section 09 3053.
 - 2. Furnish quantity of full-size units for each type, composition, color, pattern, and size indicated.

2.9 CERAMIC TILING (SWIMMING POOLS) (09 3073)

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to one case for each type, composition, color, pattern, and size indicated.

2.10 ACOUSTIC TILE CEILINGS (09 5123)

- A. Replacement stock amounting to one full box (minimum 12 tiles) of each type.

2.11 STONE FLOORING (09 6340)

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units:
 - a. Refer to Section 09 6340.
 - b. Furnish quantity of full-size units equal to one case for each type, composition, color, pattern, and size indicated.

2.12 WOOD PARQUET FLOORING (09 6423)

- A. Furnish extra materials matching products installed, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Flooring: Equal to one full carton of product installed from same production run as original material supplied to the project.
 - 2. Include manufacturer's instruction sheet, including sources and contact information to obtain recommended adhesives and technical assistance.

2.13 RESILIENT FLOORING (09 6500)

- A. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Furnish not less than one box of each class, wearing surface, color, pattern, and size of resilient floor tile and base installed.

2.14 RESILIENT ATHLETIC FLOORING (09 6566)

- A. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Furnish for each class, wearing surface, color, pattern, and size of resilient floor tile installed.
 - a. Refer to Section 09 6566

2.15 CARPETING (09 6800)

- A. Furnish extra materials described below before installation begins that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Roll Goods Carpet: Full-width rolls equal to five (5) percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).
 - 2. Carpet Tile: Full-size units equal to five (5) percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m) and in full boxes.
 - 3. The Owner shall be permitted to view all carpet scraps and retain any that is chosen for future repairs before they are removed from the job site.

2.16 WALLCOVERING (09 7200)

- A. Package materials with protective covering and identify with labels describing contents.
 - 1. Furnish full-size units equal to two full rolls of each type installed and return all unused material to Owner.

2.17 EXTERIOR PAINTING (09 9113)

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage.
 - 1. Quantity: Furnish the Owner with two (2) gallons of each material and color applied in addition to any leftover amounts.
 - 2. All cans shall be labeled with Finish Index number.

2.18 INTERIOR PAINTING (09 9123)

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage.
 - 1. Quantity: Furnish the Owner with two (2) gallons of each material and color applied in addition to any leftover amounts.
 - 2. All cans shall be labeled with Finish Index number.

2.19 STAINING & TRANSPARENT FINISHING (09 9300)

- A. Furnish extra stain materials from the same production run as the materials applied in the quantities described below. Package stain materials in unopened, factory-sealed containers for storage.
 - 1. Quantity: Furnish the Owner with two (2) gallons of each material and color applied in addition to any leftover amounts.
 - 2. All cans shall be labeled with Finish Index number.

SPARE PARTS

2.20 HIGH-PERFORMANCE COATINGS (09 9600)

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage.
1. Quantity: Furnish the Owner with two (2) gallons of each material and color applied in addition to any leftover amounts, but not less than 5 percent of paint installed.
 2. All cans shall be labeled with Finish Index number.

2.21 GRAFFITI RESISTANT COATINGS (09 9623)

- A. Furnish extra coating materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage.
1. Quantity: Furnish the Owner with two (2) gallons of each material and color applied in addition to any leftover amounts.
 2. All cans shall be labeled with Finish Index number.

2.22 HIGH-PERFORMANCE ACRYLIC FINISHES FOR INDOOR POOLS (09 9628)

- A. Furnish extra finish coat materials from the same production run as the materials applied in the quantities described below. Package finish coat materials in unopened, factory-sealed containers for storage.
1. Quantity: Furnish the Owner with two (2) gallons of each finish coat material and color applied in addition to any leftover amounts, but not less than 5 percent of paint installed.
 2. All cans shall be labeled with Finish Index number.

2.23 WALL AND DOOR PROTECTION (10 2600)

- A. Furnish extra materials matching products installed as described below, packaged for storage and identified with labels clearly describing contents.
1. Furnish for each type of wall protection for each color and material.
 - a. Refer to Section 10 2600

2.24 FIRE SUPPRESSION (21 1000)

- A. Operating key handles: Furnish one extra for each key-operated hose bibb and hydrant installed.
- B. Sprinkler Cabinets:
1. Finished, wall-mounting steel cabinet and hinged cover, with space for a minimum of six spare sprinklers plus sprinkler wrench.
 2. Include the number of sprinklers required by NFPA 13 and wrench for sprinklers.
 3. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

2.25 PLUMBING FIXTURES (22 4000)

- A. Shower Heads: Two units of each type.
- B. Faucet Sets: Five complete sets for Guest Room units.
- C. Toilet Seats: Furnish quantity of identical units not less than 2 of each type installed.

2.26 AIR DUCT ACCESSORIES (DIVISION 23 & 23 3300)

- A. Fusible Links: Furnish quantity equal to 5 of each type installed.
- B. Two of each installed filter.

2.27 HVAC POWER VENTILATORS (23 3423)

- A. Furnish one set of belts for each belt-driven fan that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

2.28 ENCLOSED CONTROLLERS (26 2913)

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents:
 - 1. Spare Fuses and Incandescent and LED Indicating Lamps: Furnish one set of three for each kind.

2.29 INTERIOR LIGHTING FIXTURES AND LAMPS (DIVISION 26 & 26 5100)

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
- B. Lamps: Five of each rating installed of the following types (Refer the Light Fixture Schedule located in the Appendix):
 - 1. LED
 - 2. Incandescent
 - 3. Fluorescent
 - 4. Compact Fluorescent
 - 5. Metal Halide

2.30 EXTERIOR LIGHTING FIXTURES AND LAMPS (DIVISION 26 & 26 5600)

- A. Furnish extra materials described below that are packaged with protective covering for storage and identified with labels describing contents.
- B. Lamps: Five of each rating installed of the following types (Refer the Light Fixture Schedule located in the Appendix):
 - 1. Incandescent.
 - 2. Fluorescent

SPARE PARTS

3. Compact Fluorescent
4. Metal Halide

2.31 FIRE ALARM AND DETECTION SYSTEMS (DIVISION 28 & 28 3000)

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
 1. Lamps for remote indicating lamp units: Two units.
 2. Lamps for strobe units: Two units.
 3. Smoke detectors, fire detectors, and carbon monoxide detectors: Two units of each type.
 4. Detector bases: Two units of each type.

2.32 CONCRETE PAVER UNITS (REFER TO DRAWINGS)

- A. Furnish stock of pavers that match blend of products installed in the amount of 10 square -feet.
- B. Refer to Landscape, Civil and Architectural drawings.

2.33 BRICK PAVER UNITS (REFER TO DRAWINGS)

- A. Furnish stock of pavers that match blend of products installed in the amount of 10 square -feet.
- B. Refer to Landscape, Civil and Architectural drawings.

2.34 DECORATIVE CMNT CONCRETE PAVING –STAIN AND DYE MATERIALS (32 1316)

- A. Furnish extra stain materials from the same production run as the materials applied in the quantities described below. Package stain materials in unopened, factory-sealed containers for storage.
 1. Quantity: Furnish the Owner with two (2) gallons of each material and color applied in addition to any leftover amounts.
 2. All cans shall be labeled with Finish Index number.

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

- SECTION 01 7900 -**DEMONSTRATION AND TRAINING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. This Section specifies the administrative requirements, procedural obligations, terms and conditions and training requirements related to instructing the facility engineering personnel in the proper care, preservation, operations and maintenance of materials, finishes, equipment and systems.
 - a. Preparation and submittal of instructor qualifications, training schedules, and agendas for various building materials, components, systems and equipment.
 - b. Instruction of the Owner's personnel and adjunct organizations in the proper operation and maintenance of all building materials, components, systems and equipment.

1.3 RELATED REQUIREMENTS

- A. Section 01 3300 "Submittal Procedures" for Preparation of Shop Drawings and Product Data.
- B. Section 01 7700 "Contract Closeout" for General closeout requirements.
- C. Section 01 7839 "Project Record Documents" for General requirements for submittal of Project Record Documents.
- D. Sections of Divisions 02 through 33 for Special operating and maintenance data requirements for specific equipment or building operating systems.
- E. Sections, Divisions 02 through 33 for additional training requirements for building systems and/or equipment.
- F. Where training manuals include information on work installed by the Contractor and their Subcontractors, the Contractor shall be responsible for the preparation of the manuals, including collection, collation and binding of the material and submittal of data as specified.

1.4 QUALITY ASSURANCE

- A. The status of training deliverables shall be an integral part of the Contractor's coordination process. The Contractor shall meet with the Owner as required, to discuss progress-to-date, deficiencies and non-compliance issues.

1.5 TRAINING MANUALS

- A. The completed FINAL VERSION of the approved Operation & Maintenance Manuals and the redlined set of the record "as-built" drawings shall be used as the basis of instruction. The Contractor is not responsible for providing additional copies of these documents for training purposes.

1.6 TRAINING HOURS

- A. Training shall be conducted during normal working hours. All training shall be completed prior to the public opening of the hotel property.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

- A. TRAINING OF FACILITY ENGINEERING, OPERATING AND MAINTENANCE PERSONNEL
 - 1. Instruct the hotel's personnel in operation, adjustment, and maintenance of all materials, components, equipment and systems.
 - a. Use the Operation and Maintenance Manuals and the Record "As-Built" Drawings for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of installation, care and preservation, operation, preventive maintenance, service, and replacement.
 - 2. The detailed review of the materials, components, systems and equipment shall include as minimum the following items:
 - a. Materials, components, systems and equipment
 - b. Safety precautions and procedures
 - c. Installation
 - d. Operational features and functions
 - e. Operational testing and diagnostics
 - f. Preventive and predictive maintenance
 - g. Service: Repair and replacement
 - h. Operation and Maintenance manual content
 - i. Commissioning: Testing, adjusting, calibration and balancing
 - j. Contractor furnished spare parts and extra materials
 - k. Recommended "spare parts" inventory not furnished by Contractor
 - l. Specialty tool requirements
 - m. Lubricants

DEMONSTRATION AND TRAINING

- n. Fuels
 - o. Identification systems
 - p. Automatic/manual control systems
 - q. Hazards/Material Safety Data Sheets
 - r. Cleaning
 - s. Procurement of replacement parts
 - t. Warranty reviews including terms and conditions, points of contact, return material procedures, effective date, extended warranty options
 - u. Maintenance agreements and similar continuing commitments
 - v. Record "As-Built" Drawings
3. As part of the operations portion of the training session, demonstrate all operational features and functions.
 4. Refer to other specification Sections for additional training requirements associated with engineering, operating and maintenance of various systems/equipment.
 5. Provide a combination of classroom, field and factory training classes which includes as a minimum the following curricula requirements as indicated hereafter:
 6. SITE WORK UTILITIES: one 2-hour class
 - a. Water, Storm, and Sanitary Sewer Facilities
 - b. Drainage Structures
 - c. Underdrains
 - d. Electrical Power Service
 - e. Gas Utilities
 7. BUILDINGS AND STRUCTURES: one 4-hour class
 - a. Concrete
 - b. Unit Masonry
 - c. Metals
 - d. Woods and Plastics
 - e. Thermal and Moisture Protection
 - f. Doors and Windows
 - g. Finishes
 - h. Specialties
 - i. Fixtures, Furnishings and Equipment
 8. HYDRAULIC ELEVATORS: one 1-hour class
 9. TRACTION ELEVATORS: one 1-hour class
 10. HVAC: one 8-hour class
 - a. Basic Materials and Methods
 - b. Piping and Specialties
 - c. Insulation
 - d. Pumping
 - e. Refrigeration
 - f. Air Handling and Distribution
 - g. Pool Dehumidification
 - h. Automatic Temperature Controls
 - i. Testing/Adjusting/Balancing

11. PLUMBING: one 4-hour class
 - a. Basic Materials and Methods
 - b. Piping and Specialties
 - c. Insulation
 - d. Pumping
 - e. Fixtures, Trim and Accessories
 - f. Domestic Water Heaters
 - g. Water Softening
12. SWIMMING POOLS AND SPAS: one 2-hour class
 - a. Basis Piping and Pumps
 - b. Filter and Deck Equipment
 - c. Pool Heater
 - d. Water Treatment
13. FIRE SPRINKLERS: one 2-hour class
 - a. Basic Materials and Methods
 - b. Standpipe and Hose Systems
 - c. Wet Pipe Sprinkler Systems
14. ELECTRICAL: one 8-hour class
 - a. Basic Materials and Methods
 - b. Service and Distribution
 - c. Service Entrance
 - d. Switchboards
 - e. Disconnects
 - f. Grounding
 - g. Transformers
 - h. Panelboards
 - i. Overcurrent Protective Devices
 - j. Contactors
 - k. Voltage Surge Suppression
 - l. Testing
 - m. Lighting
 - n. Interior and Exterior Luminaries, Lamps and Accessories
 - o. Emergency Lighting
 - p. Heat Tracing
15. SOUND SYSTEM: one 1-hour class
16. COMMUNICATION: one 2-hour class
 - a. Voice and Data
 - b. Television Distribution System
 - c. Security Intercom System
17. FIRE ALARM SYSTEM: one 4-hour class
 - a. System Zoning and Operations
 - b. End-Devices
 - c. Carbon Monoxide Monitoring

DEMONSTRATION AND TRAINING

- d. Supervisory and Control Interface
 - 1) Sprinkler Systems
 - 2) Elevators
 - 3) HVAC Fan Control
 - 4) Telephone
 - e. Graphic Enunciators
 - f. Signage
18. FOOD SERVICE & LAUNDRY EQUIPMENT: one 8-hour class
- a. The Food Service & Laundry Equipment Contractor shall schedule demonstrations of all Class 2, 3 and 4 equipment by Factory Authorized Demonstrators, at times convenient to the Owner. Demonstration shall include competent instruction in the use, cleaning, repair, and maintenance of the equipment.
 - 1) Class 1 - Equipment that requires no demonstration. Written instructions will suffice (i.e. roll warmers, toasters, racks, refrigerators, etc.).
 - 2) Class 2 - Equipment that is easy to understand and quickly demonstrated by a Factory Authorized Demonstrator (i.e. ranges, slicers, disposers, etc.).
 - 3) Class 3 - Complex equipment which requires more in-depth knowledge of assembly, operation, maintenance or cleaning. (i.e. steam equipment, multi-tank dish washers, fryer batteries, etc.).
 - 4) Class 4 - High technology equipment or systems that require extensive training, or for which demonstrations are factory-required. (i.e. cook-chill systems, conveyor ovens, etc.).

- END OF SECTION -

- SECTION 01 8316 -

EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies Design Criteria for Exterior Façade Enclosure.
 - 1. Design, fabricate and install component parts so that the completed exterior wall will withstand the forces (such as inward and outward wind pressures) and movements (including loading deflections, shrinkage, creep, seismic, wind, thermal and similar movements), as specified in this section and as amplified in related sections.

1.3 RELATED REQUIREMENTS

- A. Related Information is noted on the Drawings.
- B. Related Sections:
 - 1. Sections specifying exterior façade components and assemblies requiring design criteria for delegated design or performance verification.
 - 2. Sections referencing this section for design criteria.
- C. Related Sections may also contain additional Design Criteria and Performance Requirements.
 - 1. Comply with additional Design Criteria and Performance Requirements specified in related sections.
 - 2. In the event of conflict between Design Criteria and Performance Requirements specified in this section and Design Criteria and Performance Requirements specified in the related section or on the Drawings, the more stringent Design Criteria and Performance Requirements shall apply.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DESIGN CRITERIA FOR EXTERIOR FACADE

- A. Wind and Seismic Design Loads: Refer to Drawings.
- B. Design Story Drift (Seismic) Refer to Drawings.
 - 1. Cement Plaster, adhered porcelain tile over cement plaster (brittle): Span/360 Typical.
 - 2. EIFS: Deflection of substrate systems shall not exceed 1/240 times the span.
 - 3. Metal Panels: Span / 240 Typical.
 - 4. Parapets: Height / 180 Typical.
 - 5. For glass wall systems (curtainwall and storefront) limit deflection to:
 - a. For spans larger than 15 feet: L/240 of clear span or 1.5 -inches, whichever is less. Limit maximum center deflection of glass to 1 -inch, and assembly of the entire assembly including glass to 2 inch.
 - b. For spans less than 15 feet: L/175 of clear span or 0.75 -inch, whichever is less. Limit maximum center deflection of glass to 1 -inch, and assembly of the entire assembly including glass to 1.5 -inch.
 - 6. Deflection shall not exceed L/360 for glass supporting members and less as specified in related sections..
- C. Gravity load deflection: Provide for minimum 1/2 -inch deflection of beams under live load.
- D. Structural Movement: Design to accommodate the following;
 - 1. Live Load Deflection: 1/2 -inch live load deflection, as well as thermal expansion and elastic shortening of the building. Identify range of accommodated deflection movement in shop drawings.
 - 2. Design the system to accommodate the seismic drift requirements in the referenced Building Code. The interpretations of the minimum design requirements are as follows:
 - a. Elastic Design Displacement: Shall be equal to 0.004 times the story height but not less than 1/2 -inch. The inelastic design displacement shall be equal to 0.02 times the story height but not less than 1 -inch.
- E. At Service Level Drift: Facade shall accommodate Service Level Drift, corresponding to 50 percent (one half) of specified Design Seismic Drift, without permanent deformation or reduction of required performance, including resistance to air leakage and water penetration.
- F. At Design Level Drift: All facade types shall be capable of accommodating Design Seismic Drift with repairable damage. Up to 10 percent of total glass panels may break, but must be retained completely with no glass fallout. Damage shall be repairable on site. Accessible seals and gaskets and trim elements may be visibly disengaged and may require replacement.
- G. At overload Seismic Drift: All facade types shall be capable of accommodating **150 percent** of Design Seismic Drift with no glass fallout and no components falling at the building exterior.

1.6 EXTERIOR FAÇADE CONSTRUCTION TOLERANCES

- A. Construction Tolerances: Range of allowable dimensional tolerances as follows:
 - 1. Variation in Plumb (dimensions from faces of exterior columns and walls): **1/4 -inch** in **10 -feet**, **1 -inch** maximum for total height of structure.
 - 2. Variations from Levels (dimensions indicated on drawings from top and bottom surfaces of beams): Plus or minus **1 -inch**.

EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS

FINAL FOR CONSTRUCTION

3. Variation from Location (dimensions indicated on drawings from outer faces of walls and framing members): Plus or minus **1 -inch**.
4. Variation from Location (dimensions indicated on drawings from adjacent surfaces of spandrel materials or jamb materials): Maximum of **1/4 -inch**.

1.7 EXTERIOR CLADDING PERFORMANCE REQUIREMENTS

- A. General framing assumptions
 1. Curtain wall supported vertically (gravity) at floor (or floor where bottom of curtain wall is at floor) and locations as shown on Drawings, configured to allow vertical movement.
 2. Curtain wall supported laterally (in-plane and out-of-plane) at each floor.
 3. Light gauge framing supported vertically at each floor; nested deflection track detail at top of wall to allow sliding of floor above relative to stud wall below.
- B. Stud framing around punched windows & curtain wall
 1. Continuous vs. jointed conditions - See drawings for location and type of joints
 2. Headers: 18 gauge minimum.
 3. Bracing: Out-of-plane bracing where required per structural calculations by Contractor's engineer.
- C. Vertical joint locations: See Architectural drawings
- D. Special details - Corners, etc.: See Architectural drawings
- E. Concrete curbs supporting cladding: See Architectural drawings
- F. Locations requiring supplemental steel framing where required per structural calculations by contractor's engineer.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 NOT USED

- END OF SECTION -

- SECTION 01 9113 -

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
 - 1. Commissioning is a systematic process to verify that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.
 - 2. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - b. Verify and document proper performance of equipment and systems.
 - 3. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.
 - 4. OPR documentation is included for information only.

1.3 RELATED REQUIREMENTS

- A. Section 01 3100 "Project Management and Coordination: To introduce commissioning and refers to this Section.
- B. Section 01 7700 "Closeout Procedures: Which defines substantial completion and functional completion, relative to commissioning.
- C. Section 22 0800 "Commissioning of Plumbing: For commissioning process activities for plumbing systems, assemblies, equipment, and components.
 - 1. Section 22 0800.01 Plumbing Testing Requirements

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- 2. Section 22 0800.02 Plumbing Prefunctional Checklists
- 3. Section 22 0800.03 Plumbing Sample Functional Test Procedures
- D. Section 23 0800 "Commissioning of HVAC: For commissioning process activities for HVAC&R systems, assemblies, equipment, and components."
 - 1. Section 23 0800.01 HVAC Testing Requirements
 - 2. Section 23 0800.02 HVAC Prefunctional Checklists
 - 3. Section 23 0800.03 HVAC Sample Functional Test Procedures
- E. Section 26 0800 "Commissioning of Electrical Systems: For commissioning process activities for integrated automation systems, assemblies, equipment, and components."
 - 1. Section 22 0800.01 "Plumbing Testing Requirements"
 - 2. Section 22 0800.02 "Plumbing Prefunctional Checklists"
 - 3. Section 22 0800.03 "Plumbing Sample Functional Test Procedures"

1.4 REFERENCES

- A. [U.S. Green Building Council's \(USGBC\)](#) Publications:
 - 1. (LEED-NC) Version 2.2 "LEED for New Construction and Major Renovations"
 - 2. (LEED-NC) Version 2.2 "Reference Guide"

1.5 DEFINITIONS

- A. Abbreviations. The following are common abbreviations used in the Specifications and in the Commissioning Plan.

A/E-	Architect and design engineers	GC-	General contractor (prime)
CxA-	Commissioning authority	MC-	Mechanical contractor
CC	Controls contractor	OR-	Owner's Representative
Cx-	Commissioning	PC-	Prefunctional checklist
Cx Plan-	Commissioning Plan document	PM-	Project manager (of the Owner)
EC-	Electrical contractor	Subs-	Subcontractors to General
FT-	Functional performance test	TAB-	Test and balance contractor
- B. Acceptance Phase. Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.
- C. Approval. Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.
- D. Architect/Engineer (A/E): The prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.
- E. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

GENERAL COMMISSIONING REQUIREMENTS

- F. CxA: Commissioning Authority. An independent agent, not otherwise associated with the A/E team members or the Contractor, hired by the Owner. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role like the CM. The CxA is part of the Construction Manager (CM) team or shall report directly to the CM.
- G. Cx Plan: Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process
- H. Datalogging: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.
- I. Deferred Functional Tests : FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.
- J. Deficiency : A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent)
- K. Design Intent: A dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.
- L. Design Narrative or Design Documentation: Sections of either the Design Intent or Basis of Design.
- M. Factory Testing: Testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.
- N. Functional Performance Test (FT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.
- O. General Contractor (GC): The prime contractor for this project. Generally refers to all the GC's subcontractors as well. Also referred to as the Contractor, in some contexts.
- P. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed

- Q. Manual Test: Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- R. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.
- S. Non-Compliance: See Deficiency.
- T. Non-Conformance: See Deficiency.
- U. Over-written Value: Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."
- V. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- W. Prefunctional Checklist (PC): A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.
- X. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.
- Y. Seasonal Performance Tests: FT that are deferred until the system(s) will experience conditions closer to their design conditions.
- Z. Simulated Condition: Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).
- AA. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.
- BB. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- CC. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists.

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- DD. Subs: The subcontractors to the GC who provide and install building components and systems.
- EE. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.
- FF. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents
- GG. Trending: Monitoring using the building control system.
- HH. Vendor: Supplier of equipment.
- II. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.6 COORDINATION

- A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CxA), the Owner's Representative (OR), the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.
- B. Management. The CxA directs and coordinates the commissioning activities and the reports to the OR. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.
- C. Scheduling. The CxA will work with the GC according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the GC for scheduling commissioning activities. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.
- D. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan—Construction Phase provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

1.7 COMMISSIONING PROCESS

- A. Commissioning Plan. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CxA will update the plan which is then considered the "final" plan, though it will continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commissioning Plan.
- B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CxA during normal submittals, including detailed start-up procedures.
4. The CxA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with prefunctional checklists to be completed, during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.
6. The Subs, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed according to the approved plans. This may include the CxA witnessing start-up of selected equipment.
7. The CxA develops specific equipment and system functional performance test procedures. The Subs review the procedures.
8. The procedures are executed by the Subs, under the direction of, and documented by the CxA.
9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
10. Commissioning is completed before Substantial Completion.
11. Deferred testing is conducted, as required based on seasonal impact.

1.8 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, the General Contractor (GC) and representatives of the Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 2. Representatives of the facility user and operation and maintenance personnel.
 3. The Owners Representative.
 4. Architect and engineering design professionals.

1.9 OWNER'S RESPONSIBILITIES

- A. Provide the OPR documentation to the CxA and Contractor for information and use.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

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- C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
- D. Follow the Commissioning Plan.
- E. Attend commissioning scoping meetings and additional meetings as necessary.

1.10 OWNERS REPRESENTATIVE'S RESPONSIBILITIES

- A. The Owner's Representative (OR) shall represent the Owner during the commissioning process as follows:
 - 1. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the "Commissioning Plan – Construction Phase".
 - 2. Provide final approval for the completion of the commissioning work.
 - 3. Addresses any seasonal or deferred testing and any deficiency issues.
 - 4. Follows the Commissioning Plan.
 - 5. Attend commissioning scoping meetings and additional meetings as necessary.

1.11 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities.
- B. Contractor and contractor's representatives shall engage in commissioning activities including, but not limited to, the following:
 - 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
 - 3. Attend commissioning team meetings, commissioning scoping meetings and additional meetings as necessary.
 - 4. Integrate and coordinate commissioning process activities with construction schedule.
 - 5. Provide detailed startup procedures
 - 6. Review and accept construction checklists provided by the CxA.
 - 7. Complete paper or electronic construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
 - 8. Review and accept commissioning process test procedures provided by the Commissioning Authority.
 - 9. Complete commissioning process test procedures.
 - 10. Include the cost of commissioning in the total contract price.
 - 11. Execute seasonal or deferred functional performance testing witnessed by the CxA to facilitate the Cx process.
 - 12. Provide a list of final settings, setpoints, ranges, schedules, and / or trend logs required by the CxA.
 - 13. Follow the Commissioning Plan.
 - 14. Provide copies of all submittals as required in this section and in Section 01 3300.

15. Prepare O&M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions
16. Provide the training of owner personnel.

1.12 EQUIPMENT SUPPLIERS RESPONSIBILITIES

- A. The equipment suppliers shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
 2. Assist in equipment testing per agreements with Subs.
 3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CxA.
 4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.
 5. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
 6. Review test procedures for equipment installed by factory representatives.
 7. Follow the Commissioning Plan.
 8. Attend commissioning scoping meetings and additional meetings as necessary.

1.13 CxA'S RESPONSIBILITIES

- A. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.
 1. Coordinates and directs the commissioning activities using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
 2. Coordinate the commissioning work and, with the GC, incorporating commissioning activities into the master schedule.
 3. Revise, as necessary, the Commissioning Plan—Construction Phase. Collaborate with Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.
 4. Review and comment on submittals from Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment

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on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

5. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
6. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
7. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
8. Write and distribute prefunctional tests and checklists.
9. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
10. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
11. Approve systems startup by reviewing start-up reports and by selected site observation.
12. Review TAB execution plan.
13. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
14. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to GC for review.
15. Analyze any functional performance trend logs and monitoring data to verify performance.
16. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
17. Maintain a master deficiency and resolution log and a separate testing record. Provide the GC with written progress reports and test results with recommended actions.
18. Compile and maintain a commissioning book.
19. Compile and maintain a building systems manual to ensure optimal operation by facility staff.
20. Oversee and approve the training of the owner's operating personnel.
21. Review and approve the O&M manuals.
22. Provide a final commissioning report.
23. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
24. Return to the site within 10 months of substantial completion and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning.

1.14 SYSTEMS TO BE COMMISSIONED

- A. The following checked systems will be commissioned in this Project.

Equipment and System	Functional Test Requirements Specified In:		Equipment and System	Functional Test Requirements Specified In:
<u>Plumbing System</u>			<u>Electrical System</u>	
Fuel Fired Domestic Water Heater	22 0800 thru 22 0800.03		Lighting Control Devices	26 0800 thru 26 0800.03
<u>HVAC System</u>				
Instrumentation and Controls for HVAC	23 0800 thru 23 08 00.03			
HVAC Power Ventilators	23 0800 thru 23 08 00.03			
Air Cooled Refrigerant Condensers	23 0800 thru 23 08 00.03			
Modular Indoor Air Handling Units	23 0800 thru 23 08 00.03			
Gas Fired Make-up Air Units	23 0800 thru 23 08 00.03			
Dedicated Outdoor Air Handling Units	23 0800 thru 23 08 00.03			
Self Contained Air Conditioning Units	23 0800 thru 23 0800.03			
Split System Air Conditioners	23 0800 thru 23 0800.03			
Air Coils	23 0800 thru 23 0800.03			
Unit Heaters	23 0800 thru 23 0800.03			
Swimming Pool Dehumidifiers	23 08 00 thru 23 0800.03			

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Contractor.

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- B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CxA.
- C. Datalogging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.
- E. Refer to Section 01 91 13, Article 3.06 E "Test Methods" for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

- A. Scoping Meeting. Within 90 days of commencement of construction, the CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan to its "final" version, which will also be distributed to all parties.
- B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs. These meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

3.2 REPORTING

- A. The CxA will provide regular reports to the OR, with increasing frequency as construction and commissioning progresses.
- B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.
- C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.
- D. A final summary report (about four to six pages, not including backup documentation) by the CxA will be provided to the OR, focusing on evaluating commissioning process issues and

identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.

3.3 SUBMITTALS

- A. The CxA will provide appropriate contractors with a specific request for the type of submittal documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CxA will be included by the Subs in their O&M manual contributions.
1. Requested Submittals:
 - a. Air Handling Units
 - b. Building Automation (if applicable)
 - c. Air Conditioning Units
 - d. Unit Heaters
 - e. Domestic Water Heaters
 - f. Domestic Hot Water Piping Insulation
 - g. Ductwork Insulation
 - h. Exhaust Fans and Power Ventilators
 - i. Lighting Controls
 - j. Pipe Insulation
 - k. Testing, Adjusting, and Balancing
 2. Requested Shop Drawings:
 - a. Ductwork
 - b. Lighting Control System
- B. The CxA will review and approve submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, and to the performance of the equipment and adequacy for developing test procedures. The commissioning authority will notify the Owner/CM, PM or A/E as requested, of items missing or areas that are not in conformance with contract documents and which require resubmission.
- C. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.
- D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor.

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3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment to be commissioned, according to Paragraph 1.12, "Systems to be Commissioned". Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.
- B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
- C. Start-up and Initial Checkout Plan. The CxA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Sections 22 08 00, 22 0800.01, 22 0800.02, 22 0800.03, 23 0800, 23 0800.01, 23 0800.02, 23 0800.03, 26 0800, 26 0800.01, 26 0800.02, and 26 0800.03.
 - 1. The CxA adapts, if necessary, the representative prefunctional checklists and procedures from Section 23 0800.02 and 26 0800.02. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
 - 2. These checklists and tests are provided by the CxA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
 - 3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:
 - a. The CxA's prefunctional checklists.
 - b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - c. The manufacturer's normally used field checkout sheets.
 - 4. The subcontractor submits the full startup plan to the CxA for review and approval.
 - 5. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
 - 6. The full start-up procedures and the approval form may be provided to the CM for review and approval, depending on management protocol.
- D. Sensor and Actuator Calibration.

1. All field-installed temperature, relative humidity, CO, CO₂ and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
2. All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
3. Sensor Calibration Methods.
 - a. All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.
 - b. Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.
 - c. Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.
 - d. Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

<u>Sensor</u>	<u>Required Tolerance (+/-)</u>		<u>Sensor</u>	<u>Required Tolerance (+/-)</u>
Cooling coil, chilled and condenser water temps	0.4F		Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F		Relative humidity	4% of design
Hot water coil and boiler water temp	1.5F		Combustion flue temps	5.0F
Outside air, space air, duct air temps	0.4F		Oxygen or CO ₂ monitor	0.1 % pts
Watthour, voltage & amperage	1% of design		CO monitor	0.01 % pts
Pressures, air, water and gas	3% of design		Natural gas and oil flow rate	1% of design
			Steam flow rate	3% of design

Flow rates, air	10% of design	Barometric pressure	0.1 in. of Hg
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4. Valve and Damper Stroke Setup and Check.
 5. EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
 - a. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
 - b. Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.
 6. Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.
- E. Execution of Prefunctional Checklists and Startup.
1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the GC and CxA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
 2. The CxA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the CM). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
 3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures are identified in the commissioning plan.
 4. The Subs and vendors shall execute startup and provide the CxA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
 5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.
- F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.
1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.

2. The CxA reviews the report and submits either a non-compliance report or an approval form to the Sub or CM. The CxA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CxA will involve the CM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA recommends approval of the execution of the checklists and startup of each system to the CM using a standard form.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party. Refer to Part 3.07 herein for details.

3.5 FUNCTIONAL PERFORMANCE TESTING

- A. This sub-section applies to all commissioning functional testing for all divisions.
- B. The general list of equipment to be commissioned is found in;
 1. Section 01 9113, Part 1.12 "Systems to be Commissioned".
 2. The specific equipment and modes to be tested are found in Sections;
 - a. 22 0800.01
 - b. 23 0800.01
 - c. 26 0800.01.
- C. The parties responsible to execute each test are listed with each test in Sections;
 1. 22 0800
 2. 22 0800.01
 3. 22 0800.02
 4. 22 0800.03
 5. 23 0800
 6. 23 0800.01
 7. 23 0800.02
 8. 23 0800.03
 9. 26 0800
 10. 26 0800.01
 11. 26 0800.02
 12. 26 0800.03.
- D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
 1. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in Sections;

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- a. 22 0800
 - b. 22 0800.01
 - c. 22 0800.02
 - d. 22 0800.03
 - e. 23 0800
 - f. 23 0800.01
 - g. 23 0800.02
 - h. 23 0800.03
 - i. 26 0800
 - j. 26 0800.01
 - k. 26 0800.02
 - l. 26 0800.03.
2. Development of Test Procedures. Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in Sections 22 0800, 22 0800.01, 22 0800.02, 22 0800.03, 23 0800, 23 0800.01, 23 0800.02, 23 0800.03, 26 0800, 26 0800.01, 26 0800.02, and 26 0800.03 the CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA may submit the tests to the A/E for review, if requested.
3. The CxA shall review owner-contracted, factory testing or required owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.
4. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.
5. Representative test formats and examples (not designed for this facility) are found in the appendices to Divisions 22, 23, and 26. The test procedure forms developed by the CxA shall include (but not be limited to) the following information:
- a. System and equipment or component name(s)
 - b. Equipment location and ID number
 - c. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
 - d. Date
 - e. Project name
 - f. Participating parties
 - g. A copy of the specification section describing the test requirements
 - h. A copy of the specific sequence of operations or other specified parameters being verified
 - i. Formulas used in any calculations
 - j. Required pre-test field measurements
 - k. Instructions for setting up the test.

- l. Special cautions, alarm limits, etc.
 - m. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
 - n. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
 - o. A section for comments
 - p. Signatures and date block for the CxA
- E. Test Methods.
 - 1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. Sections 22 0800, 22 0800.01, 22 0800.02, 2208 00.03, 23 0800, 23 0800.01, 23 0800.02, 23 0800.03, 26 0800, 26 0800.01, 26 0800.02, and 26 0800.03 specify which methods shall be used for each test. The CxA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the CM. This may require a change order and adjustment in charge to the Owner. The CxA will determine which method is most appropriate for tests that do not have a method specified.
- F. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
- G. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
- H. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
- I. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
- J. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
- K. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At

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completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

- L. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The specific recommended sampling rates are specified with each type of equipment in Sections 22 08 00, 22 08 00.01, 22 08 00.02, 22 99 53, 23 08 00, 23 08 00.01, 23 08 00.02, 23 08 00.03, 26 08 00, 26 08 00.01, 26 08 00.02, and 26 08 00.03. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.
1. A common sampling strategy referenced in the Specifications as the "xx% Sampling—yy% Failure Rule" is defined by the following example:
 - a. xx = the percent of the group of identical equipment to be included in each sample.
 - b. yy = the percent of the sample that if failing, will require another sample to be tested.
 2. The example below describes a 20% Sampling—10% Failure Rule.
 - a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
 - b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
 - c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
 - d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.
- M. Coordination and Scheduling. The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests through the, GC and affected Subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.
1. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.
- N. Test Equipment. Refer to Section 0 191 13, Part 2 for test equipment requirements.
- O. Problem Solving. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

3.6 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

- A. Documentation. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the GC for review and approval and to the Subs for review. The CxA will include the filled out forms in the O&M manuals.
- B. Non-Conformance.
 - 1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the GC on a standard non-compliance form.
 - 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
 - 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the GC.
 - 4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.
 - 5. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
 - a. The CxA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CxA submits the non-compliance reports to the GC for signature, if required. A copy is provided to the Sub and CxA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.
 - b. The CxA reschedules the test and the test is repeated.
 - 6. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - a. The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the GC and to the Sub representative assumed to be responsible.
 - b. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Project Manager.
 - c. The CxA documents the resolution process.
 - d. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.
 - 7. Cost of Retesting.
 - a. The cost for the Sub to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
 - b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CxA's time for a second

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retest will be charged to the GC, who may choose to recover costs from the responsible Sub.

- c. The time for the CxA to direct any retesting required because a specific prefunctional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.
 - d. Refer to the sampling section of Section 01 91 13, Part 3.06 "Documentation, Non-Conformance And Approval Of Tests" for requirements for testing and retesting identical equipment.
8. The Contractor shall respond in writing to the CxA and OR at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
 9. The CxA retains the original non-conformance forms until the end of the project.
 10. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.
- C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the OR. In such case, the Contractor shall provide the Owner with the following:
1. Within one week of notification from the OR, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the OR within two weeks of the original notice.
 2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
 3. The OR will determine whether a replacement of all identical units or a repair is acceptable.
 4. Two examples of the proposed solution will be installed by the Contractor will be allowed to test the installations for up to one week, upon which the OR will decide whether to accept the solution.
 5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- D. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA and by the OR, if necessary. The CxA recommends acceptance of each test to the OR using a standard form. The OR gives final approval on each test using the same form, providing a signed copy to the CxA and the Contractor.

3.7 DEFERRED TESTING

- A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the OR. These tests will be conducted in

the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

- B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

3.8 WRITTEN WORK PRODUCTS

- A. The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan—Construction Phase, lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

<u>Product</u>	<u>Developed By</u>
1. Final commissioning plan	CxA
2. Cx meeting minutes	CxA
3. Commissioning schedules	CxA with GC
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and A/E as needed
5. Prefunctional checklists	CxA
6. Startup and initial checkout plan	Subs and CxA (compilation of existing documents)
7. Startup and initial checkout forms filled out	Subs
8. Final TAB report	TAB
9. Issues log (deficiencies)	CxA
10. Commissioning Progress Record	CxA
11. Deficiency reports	CxA
12. Functional test forms	CxA
13. Filled out functional tests	CxA
14. Commissioning record book	
15. Final commissioning report	CxA

- END OF SECTION -

DIVISION 02 – EXISTING CONDITIONS

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- SECTION 02 3200 -**SUBSURFACE INVESTIGATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes all labor, materials, tools, equipment, transportation, and temporary construction of any nature necessary for a complete operational installation of all work shown on the Drawings and/ or specified hereinafter.

1.3 RELATED REQUIREMENTS

- A. Consult all other Specification sections Division 02 through Division 33 to determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete operational installation.
- B. Section 02 4116 "Structure Demolition" for structure demolition, clearing and removal of above- and below-grade improvements.
- C. Section 03 1000 "Concrete Forming and Accessories"
- D. Section 03 3000 "Cast-in-Place Concrete".
- E. Section 03 3816 "Unbonded Post-Tensioned Concrete".
- F. Section 07 1326 "Self Adhering Sheet Waterproofing" for below grade waterproofing.
- G. Section 07 1413 "Hot-Fluid Applied Rubberized Asphalt Waterproofing"
- H. "Site Clearing", refer to Civil drawings and Section 31 0900 "Civil Earthwork Work"
- I. "Earth Moving", refer to Civil drawings and Section 31 0900 "Civil Earthwork Work"
- J. "Soil Treatment", refer to Civil drawings
- K. "Trenching Backfilling", refer to Civil drawings and Section 31 0900 "Civil Earthwork Work"
- L. "Erosion Control", refer to Civil drawings and Section 31 0900 "Civil Earthwork Work"

- M. Section 31 0900 "Civil Earthwork Work"
- N. "Aggregate Base Courses", refer to Civil drawings and Section 32 0900 "Civil Exterior Improvements Work"
- O. "Asphalt Paving", refer to Civil drawings and Section 32 0900 "Civil Exterior Improvements Work"
- P. "Concrete Paving", refer to Civil drawings and Section 32 0900 "Civil Exterior Improvements Work"
- Q. Section 32 0900 "Civil Exterior Improvement Work" Section 32 1316 "Decorative Cement Concrete Paving"
- S. "Curbs, Gutters, Sidewalks and Driveways", refer to Civil drawings and Section 32 0900 "Civil Exterior Improvements Work"
- T. Section 33 0900 "Civil Utilities Work"
- U. Consult all other Specification sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete operational installation.
- V. Selective Site Demolition for site demolition, clearing and removal of above and below-grade improvements, refer to Civil Drawings.
- W. Shoring, refer to Shoring Drawings.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D1556: Standard Test Method for Density and Unit Weight of Soil in Place by Sand Cone Method for soils with appreciable amounts of rock or coarse materials in excess of 1 1/2 -inches (38mm) in diameter.
 - 2. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft. lbf/ft³).
 - 3. ASTM D2922: Standard Test Methods for Density of Soil and Aggregate in Place by Nuclear Methods (Shallow Depths).
- C. Arizona Department of Transportation (ADOT)
 - 1. ADOT Construction Manual

1.5 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
 - 1. Engineering services are defined as those performed for Land Surveying

SUBSURFACE INVESTIGATION

1.6 INFORMATION ON SITE CONDITIONS

- A. Subsurface soil investigations have been made, and the results are included in the Appendix of these Specifications. The report is included only to inform the Contractor of the type and character of materials to be encountered.
1. A geotechnical investigation report was prepared by SPEEDIE And Associates as follows:
 - a. Geotechnical Report, designated as; Marriot Hotel @ Luhrs City Center, Location; NWC Madison Street & Central Phoenix, Arizona, Client; Awbrey Cook McGill Architects, Project Number; 130174SA, March 6, 2014. See Appendix C of this specification.

1.7 SOILS INVESTIGATION INTERPRETATION

- A. Soils investigation data is provided by the Owner for information and the convenience of bidders.
1. Bidders are urged to examine soils investigation data and to make their own investigation of the site before bidding.
 2. The Owner and Architect disclaim any responsibility for the accuracy, true location and extent of the soils investigations that have been prepared by others.
 3. They further disclaim responsibility for interpretation of that data by bidders as in projecting soil-bearing values, rock or soil profiles, soil stability and the presence, level and extent of underground water.
 4. Soils investigation data is not part of the Contract Documents.
- B. Architect does not provide a warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unlooked for developments may not occur.
- C. Topographic maps showing a record of data obtained by the Architect's and Owner's investigations of surface and subsurface conditions that are made available as part of the Plans shall not be considered a part of the Contract Documents.
1. Said maps represent only the opinion of the Architect as to the character of the site information and the materials encountered by the Architect in his or her investigations and are provided only for the orientation of the Contractor.
- D. Information derived from inspection of topographic maps, or from Drawings showing locations or dimensions of utilities and structures will not in any way relieve the Contractor from making such additional investigations as it may elect, or from properly fulfilling all the terms of the Contract Documents.
1. The Contractor is to make any site investigation he deems necessary to become completely familiar with the site.
- E. Portions of the work may require cutting, removal, and disposal of existing roadway surfacing prior to trenching and/or prior to trench surfacing.
1. Existing pavement types and thicknesses vary throughout the project.
 2. Contractor shall perform work required to complete existing roadway cutting, removal, and disposal of whatever roadway materials are encountered for the contract price stated, and no additional compensation will be allowed.

1.8 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall satisfy itself as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling, and storage of materials; availability of labor, water, electric power, roads; and uncertainties of weather, access, traffic, runoff, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, and for the completion and closeout of the Work; and all other matters which can in any way affect the Work, or the cost thereof under this Contact.
- B. The Contractor shall become familiar with the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site, any exploratory work done by the Owner, as well as from information presented by the Drawings and Specifications made a part of this Contract and other information not made a part of this Contract.
 - 1. Any failure by the Contractor to become acquainted with all the available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the Work.
- C. Existing survey monuments, reference points or other existing monumentation shall be preserved.
 - 1. If such facilities must be removed, the Contractor shall notify Architect within ten (10) working days of required removal so that such points can be referenced for reinstallation.
 - 2. Such surveys of reinstallation, penalties, regulatory processes, fees and costs to perform the additional work shall be completed by the Contractor who shall cause the work to be done by a legally qualified professional engineer qualified to practice in jurisdiction where Project is located and who is experienced in providing Land Surveying services of the kind indicated, at no additional cost to Owner .
- D. The Contractor shall anticipate underground obstructions such as, but not limited to, water lines, gas lines, sewer lines, communication lines, utility lines, concrete, water table, soil conditions and debris.
 - 1. No extra payment will be allowed for removal, replacement, repair or possible increased cost caused by underground features, piping, conduit, or obstructions.
 - 2. Any such lines or obstructions indicated on the drawings imply only the approximate location and must be verified in the field by the Contractor.
 - 3. The Owner and Architect will endeavor to familiarize the Contractor with all known underground surface laterals for utilities and obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating all underground obstructions.

1.9 ADDITIONAL INFORMATION

- A. Contractor may make its own investigations subject to time schedules and arrangements approved in advance by the Architect.
 - 1. Before any subsurface test holes are excavated, obtain approval of Architect and obtain permits from the Owner and other applicable agencies prior to performing such work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

- SECTION 02 4116 -**STRUCTURE DEMOLITION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of buildings.
 - 2. Removing below-grade construction.
 - 3. Salvaging items for reuse by Owner.
- B. Related scope by others:
 - 1. Disconnecting, capping or sealing, and abandoning in-place and/or removing site utilities in accordance with;
 - a. Civil drawings.
 - b. Shoring drawings and sheet specifications.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Uniform Plumbing Code (UPC) 2006 with City of Phoenix administrative provisions and amendments.
- C. International Mechanical Code with City of Phoenix administrative provisions and amendments.
- D. National Electrical Code / NFPA 70 2008, with City of Phoenix administrative provisions and amendments.
- E. Section 01 1000 "Summary of Work" for use of the premises and phasing requirements.

- F. Section 01 3200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
- G. Division 22 Sections and/or plumbing drawings for demolishing or relocating site plumbing items.
- H. Division 26 Sections and/or electrical drawings for demolishing or relocating site electrical items.
- I. Civil drawings for Selective Site Demolition including but not limited to; utilities, paving, sidewalks, flatwork and plantings.
- J. Shoring Drawings.

1.5 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- C. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- D. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1.6 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified refrigerant recovery technician.
- B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.
 - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.
- C. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - a. Coordinate work with;

STRUCTURE DEMOLITION

1) Refer to Civil drawings.

3. Shutoff and capping or re-routing of utility services.

a. Coordinate work with;

1) Civil drawings.

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Predemolition Photographs : Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

1. Comply with Section 01 3233 "Photographic Documentation." Submit before the Work begins.

F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

H. Closeout Submittals:

1. Submit under provisions of Section 01 1700.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

D. Predemolition Conference: Conduct conference at Project site .

1. Inspect and discuss condition of construction to be demolished.

2. Review structural load limitations of existing structures.

3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review and finalize protection requirements.

5. Review procedures for noise control and dust control.

6. Review procedures for protection of adjacent buildings.

7. Review items to be salvaged and returned to Owner.

1.9 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 2. Before building demolition, Owner will remove the following items:
 - a. To be determined.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.10 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations and operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils:
 - 1. Comply with Project Soils Report.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
 - 1. Refer to Civil drawings.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

STRUCTURE DEMOLITION

- C. Inventory and record the condition of items to be removed and salvaged.
 - 1. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 - a. Comply with Section 01 3233 "Photographic Documentation."
- D. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 2. Cut off pipe or conduit a minimum of 24 -inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
 - 3. Coordinate work with;
 - a. Refer to Civil drawings for Selective Site Demolition.
 - 4. Arrange to shut off indicated utilities with utility companies.
- C. Existing Utilities: See plumbing and electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities.
 - 1. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of demolition.
- E. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to storage area indicated on Drawings.
 - 5. Protect items from damage during transport and storage.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 01 5000 "Temporary Facilities, Utilities & Controls."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 - 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain fire watch during and for at least (6) six hours after flame cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.

- C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- D. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Items to be removed and salvaged are indicated on Drawings.
- D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
 - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely .
- E. Existing Utilities
 - 1. Removal of existing below grade utilities shall be done in accordance with;
 - a. Civil drawings.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in;
 - 1. Project Soils report.
- C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

- END OF SECTION -

DIVISION 03 – CONCRETE

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- SECTION 03 1000 -**CONCRETE FORMING AND ACCESSORIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete formwork.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3200 "Concrete Reinforcing" for cast-in-place concrete reinforcement.
- C. Section 03 3000 "Cast-in-Place Concrete".
- D. Section 03 3500 "Concrete Finishing"
- E. Section 32 1316 "Decorative Cement Concrete Paving" for decorative concrete pavement and walks.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300 "Submittal Requirements".
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:

1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 1. Location of construction joints is subject to approval of the Architect.
- G. Samples: For waterstops.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer .
- B. Material Certificates: For each of the following, signed by manufacturers:
 1. Form materials and form-release agents.
- C. Field quality-control reports.
- D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- B. Preinstallation Conference: Conduct conference at Project site .
 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 2. Review:

- a. Special inspection and testing and inspecting agency procedures for field quality control.
- b. Curing procedures
- c. Construction contraction and isolation joints, and joint-filler strips
- d. Forms and form removal limitations
- e. Anchor rod and anchorage device installation tolerances
- f. Shoring and reshoring procedures

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000 "Product Requirements".

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Exposed to view Public Area's:
 - 1) High-density overlay, Class 1 or better.
 - b. Exposed to view (BOH) Back of House Area's:
 - 1) Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Concealed locations:
 - 1) Structural 1, B-B or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 -inch by 3/4 -inch (19 by 19 mm), minimum.
- D. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 -inch (6 mm) thick.

- E. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or Type S, Grade NS, that adheres to form joint substrates.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Petroleum based products and/or products with petroleum in them are not allowed.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Greenstreak.
 - b. Williams Products, Inc.
 - 2. Profile: Ribbed with center bulb.
 - 3. Dimensions: 4 -inches by 3/16 -inch thick (100 mm by 4.75 mm thick) or 6 -inches by 3/8 -inch thick (150 mm by 10 mm thick) ; nontapered.
- B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. JP Specialties, Inc.; Earth Shield TPE-Rubber.
 - b. Vinylex Corp.; PetroStop.
 - c. WESTEC Barrier Technologies, Inc.; 600 Series TPE-R.
 - 2. Profile: Ribbed with center bulb .
 - 3. Dimensions: 4 -inches by 3/16 -inch thick (100 mm by 4.75 mm thick) or 6 -inches by 3/16 -inch thick (150 mm by 4.75 mm thick); nontapered.

- C. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BoMetals, Inc.
 - b. Greenstreak.
 - c. Paul Murphy Plastics Company.
 - d. Vinylex Corp.
 2. Profile: Ribbed with center bulb .
 3. Dimensions: 4 -inches by 3/16 -inch thick (100 mm by 4.75 mm thick) or 6 -inches by 3/8 -inch thick (150 mm by 10 mm thick) ; nontapered.
- D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 -inch (19 by 25 mm).
1. Products: Subject to compliance with requirements, provide the following :
 - a. Carlisle Coatings & Waterproofing, Inc.; MiraSTOP.
 - b. CETCO; Volclay Waterstop-RX.
 - c. Concrete Sealants Inc.; Conseal CS-231.
 - d. Greenstreak; Swellstop.
 - e. Henry Company, Sealants Division; Hydro-Flex.
 - f. JP Specialties, Inc.; Earth Shield Type 20.
- E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 -inch (10 by 19 mm).
1. Products: Subject to compliance with requirements, provide the following :
 - a. Adeka Ultra Seal/OCM, Inc.; Adeka Ultra Seal.
 - b. Greenstreak; Hydrotite.
 - c. Vinylex Corp.; Swellseal.

PART 3 - EXECUTION

3.1 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 FORMWORK – ARCHITECTURAL CONCRETE

- A. General:
 - 1. Comply with Section 03 3000 "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.
 - 2. Comply with Section 03 3500 "Concrete Finishing" for formwork Class A, B, C & D criteria.
- B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- C. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place Architectural Concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

3.3 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- D. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Refer to Section 03 3500 "Concrete Finishing" for formwork Class A, B, C & D criteria.
- E. Construct forms tight enough to prevent loss of concrete mortar.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to

prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.4 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.5 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than **50 deg F (10 deg C)** for 24 hours after placing concrete.
 - 1. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 2. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 56-day design compressive strength.
 - a. Coordinate and comply with Structural drawings if more restrictive.
 - 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.6 SHORES AND RESHORES

- A. Comply with **ACI 318 (ACI 318M)** and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated.
 - 3. Embed keys at least **1-1/2 -inches (38 mm)** into concrete.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated on Drawings .
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness.
 - 1. Refer also to Structural Drawings.

3.8 WATERSTOPS

- A. Flexible Waterstops:
 - 1. Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable.
 - 2. Support and protect exposed waterstops during progress of the Work.
 - 3. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops:
 - 1. Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

- END OF SECTION -

- SECTION 03 2000 -**CONCRETE REINFORCING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete reinforcement and applicable accessories.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 1000 "Concrete Forming and Accessories" for cast-in-place concrete formwork.
- C. Section 03 3000 "Cast-in-Place Concrete" for cast-in-place concrete.
- D. Section 32 1316 "Decorative Cement Concrete Paving" for decorative concrete pavement and walks.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:

1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 1. Steel reinforcement and accessories.
 2. Fiber reinforcement.
- D. Field quality-control reports.
- E. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- B. Preinstallation Conference: Conduct conference at Project site .
 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 2. Review;
 - a. Special inspection and testing and inspecting agency procedures for field quality control
 - b. Concrete finishes and finishing
 - c. Curing procedures
 - d. Construction contraction and isolation joints, and joint-filler strips
 - e. Semirigid joint fillers
 - f. Forms and form removal limitations
 - g. Shoring and reshoring procedures
 - h. Anchor rod and anchorage device installation tolerances
 - i. Steel reinforcement installation

- j. Hot-weather concreting procedures

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 and Grade 75 , deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed, Grade 60 and Grade 80.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 ASTM A 706/A 706M, deformed bars, assembled with clips.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.2 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 -inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated on Drawings. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
 - 1. A second coat. Maintain continuity of coating and repair damage during curing period.

3.3 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Headed bolts and studs.

- END OF SECTION -

- SECTION 03 3000 -**CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Cast-in place concrete, including formwork, reinforcement, concrete materials, accessories mix design, placement procedures, and finishes.
 - 2. Curing compound.
 - 3. Curing and Sealing compound.

1.3 RELATED REQUIREMENTS

- A. Section 02 3200 "Subsurface Investigation"
- B. Section 03 1000 "Concrete Forming and Accessories"
- C. Section 03 2000 "Concrete Reinforcing"
- D. Section 03 3500 "Concrete Finishing"
- E. Section 03 3719 "Pneumatically Placed Concrete (Swimming Pools)"
- F. Section 03 3816 "Unbonded Post-Tensioned Concrete"
- G. Section 03 5413 "Gypsum Cement Underlayment"
- H. Section 05 5000 "Metal Fabrications"
- I. Section 07 2633 "Water Vapor Emission Control Coating"
- J. Section 07 9200 "Joint Sealants"
- K. Section 07 9213 "Exterior Façade Joint Sealants"
- L. Section 13 1133 "Elevated Swimming Pool"

M. Section 32 1316 "Decorative Cement Concrete Paving"

N. Section 33 0200 "General Provisions for Utilities"

1.4 REFERENCES

A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

B. American Association of State Highway and Transportation Officials (AASHTO) Publications:

1. M 182: Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats

C. American Concrete Institute (ACI) Publications:

1. 301 "Specification for Structural Concrete."
2. 117 "Standard Specifications for Tolerances for Concrete Construction and Materials."
3. 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete".
4. 211.2 "Standard Practice for Selecting Proportions for Structural Lightweight Concrete".
5. 212 "Chemical Admixtures for Concrete"
6. 214R "Evaluation of Strength Test Results of Concrete"
7. 301 "Standard Specification for Structural Concrete"
8. 302 "Guide for Concrete Floor and Slab Construction"
9. 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete".
10. 305R "Hot Weather Concreting".
11. 308 "Standard Practice for Curing Concrete"
12. 309R "Guide for Consolidation of Concrete".
13. 311.4R "Guide for Concrete Inspection".
14. 318 "Building Code Requirements for Structural Concrete".
15. 347R "Guide to Formwork for Concrete".
16. 544 "Fibers Reinforced Concrete"
17. SP-66 "ACI Detailing Manual".

D. ASTM International (ASTM) Publications:

1. A82 "Standard Specification for Steel Wire, Plain, for Concrete Reinforcement"
2. A184 "Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement"
3. A185 "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete"
4. A496 "Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement"
5. A497 "Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete"
6. A615 "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"
7. A706 "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement"
8. C31 "Standard Practice for Making and Curing Concrete Test Specimens in the Field"
9. C33 "Standard Specification for Concrete Aggregates"

10. C39 "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens"
 11. C42 "Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete"
 12. C94 "Standard Specification for Ready-Mixed Concrete"
 13. C150 "Standard Specification for Portland Cement"
 14. C171 "Standard Specification for Sheet Materials for Curing Concrete"
 15. C172 "Standard Practice for Sampling Freshly Mixed Concrete"
 16. C309 "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete"
 17. C494 "Standard Specification for Chemical Admixtures for Concrete"
 18. C618 "Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete"
 19. C881 "Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete"
 20. C989 "Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars"
 21. C1059 "Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete"
 22. C1077 "Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation"
 23. C1116 "Standard Specification for Fiber-Reinforced Concrete and Shotcrete"
 24. C1315 "Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete"
 25. D1751 "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)"
 26. D1752 "Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction"
 27. D2240 "Standard Test Method for Rubber Property—Durometer Hardness"
 28. E329 "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction"
 29. E548 "Guide for General Criteria Used for Evaluating Laboratory Competence"
 30. E1643 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs"
- E. American Welding Society (AWS) Publications:
1. D1.4 "Structural Welding Code - Reinforcing Steel"
- F. Concrete Reinforcing Steel Institute (CRSI) Publications:
- CRSI
1. "Manual of Standard Practice"
 2. CRSI-WCRSI "Placing Reinforcing Bars"
- G. National Ready Mixed Concrete Association's (NRMCA) Publications:
1. "Certification of Ready Mixed Concrete Production Facilities"
- H. U.S. Department of Commerce (DOC), National Institute of Standards and Technology (NIST) Publications:

1. PS 1 "Construction and Industrial Plywood"

1.5 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.6 SUBMITTALS

- A. Product Data:
 1. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project.
 2. Product Data for each product specified.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mix water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures. Coordinate built-in items including anchor bolts, plates and clips.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.
- F. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- G. Material Certificates: Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project.
 1. Cementitious materials and aggregates.
 2. Form materials and form-release agents.
 3. Steel reinforcement and reinforcement accessories.
 4. Fiber reinforcement.
 5. Admixtures.
 6. Waterstops.
 7. Curing materials.
 8. Floor and slab treatments.
 9. Bonding agents.
 10. Adhesives.

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11. Vapor retarders.
12. Epoxy joint filler.
13. Joint-filler strips.
14. Repair materials.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer with a minimum of five years experience, who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's (NRMCA) "Certification of Ready Mixed Concrete Production Facilities."
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 1. ACI 301, "Specification for Structural Concrete."
 2. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete".
 4. ACI 212 "Chemical Admixtures for Concrete"
 5. ACI 214R "Evaluation of Strength Test Results of Concrete"
 6. ACI 301 "Standard Specification for Structural Concrete"
 7. ACI 302 "Guide for Concrete Floor and Slab Construction"
 8. ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete".

9. ACI 305R "Hot Weather Concreting".
 10. ACI 308 "Standard Practice for Curing Concrete"
 11. ACI 309R "Guide for Consolidation of Concrete".
 12. ACI 311.4R "Guide for Concrete Inspection".
 13. ACI 318 "Building Code Requirements for Structural Concrete".
 14. ACI 347R "Guide to Formwork for Concrete".
 15. ACI 544 "Fibers Reinforced Concrete"
 16. ACI SP-66 "ACI Detailing Manual".
- H. Other Publications. Comply with the following, unless more stringent provisions are indicated:
1. Concrete Reinforcing Steel Institute (CRSI): CRSI-WCRSI "Placing Reinforcing Bars"
 2. American Welding Society (AWS) D1.4 "Structural Welding Code - Reinforcing Steel".
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section - "Administrative and Coordination."
1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractor.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
1. Avoid damaging coatings on steel reinforcement.
 2. Repair damaged epoxy coatings on steel reinforcement according to ASTM D3963.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1, or better. (Exposed to view Public spaces)
 - b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed. (Exposed to view (BOH) Back of House spaces)
 - c. Structural 1, B-B, or better, mill oiled and edge sealed. (Concealed locations)
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

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- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated colorless biobased oil, form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706, deformed.
- C. Steel Bar Mats: ASTM A184, assembled with clips.
 - 1. Steel Reinforcement: ASTM A615, Grade 60, deformed bars.
 - 2. Steel Reinforcement: ASTM A706, deformed bars.
- D. Plain-Steel Wire: ASTM A82, as drawn.
- E. Plain-Steel Wire: ASTM A82, galvanized.
- F. Deformed-Steel Wire: ASTM A496.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view or weather where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A615, Grade 60. Cut bars true to length with ends square and free of burrs.
- C. Tie Wire: Minimum 16 gage annealed type.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type II.
- B. Portland Cement: ASTM C150, Type V.
 - 1. Fly Ash: ASTM C618, Class F.
 - a. Report the chemical analysis of the fly ash in accordance with ASTM C311. Evaluate and classify fly ash in accordance with ASTM D5759.
- C. Normal-Weight Aggregate: ASTM C33, uniformly graded, and as follows:
 - 1. Class: Negligible weathering region, but not less than 1N.
 - 2. Nominal Maximum Aggregate Size: 1-1/2 -inches.
- D. Water: Potable and complying with ASTM C94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Water-Reducing Admixture: ASTM C494, Type A.
- C. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
- D. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.
- E. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
- F. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None.
 - 2. Approved Manufacturers:
 - a. "Catexol 1000CL"; Axim Italcementi Group, Inc. (800-899-8795)
 - b. "MCI 2000 or MCI 2005"; Cortec Corporation (800-426-7832)
 - c. "DCI or DCI-S"; W. R. Grace & Co., Construction Products Div. (800-778-2880)
 - d. "Rheocrete 222+"; BASF Admixture Group (216-839-7000)
 - e. "FerroGard-901"; Sika Construction Products Division, Sika Corporation (800-933-7452)
 - f. "Eucon CIA"; Euclid Chemical Co, An RPM Company; (800-321-7628)

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: Ribbed with center bulb.

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- B. Avendra, LLC Preferred Manufacturers:
 - 1. None
- C. Approved Manufacturers:
 - 1. PVC Waterstops:
 - a. "PVC Waterstop"; Greenstreak, Inc.; (800-325-9504)
 - b. "Sealtight PVC Waterstops"; W. R. Meadows, Inc.; (800-342-5976)
 - c. Westec Barrier Technologies; Div. of Western Textile Products, Inc., (800-793-7832)
- D. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. "Volclay Waterstop-RX"; CETCO, Subsidiary of AMCOL International Corp; (800-527-9948)
 - b. "Hydrotite"; Greenstreak, Inc.; (800-325-9504)
 - c. "Adeka Ultra Seal"; OCM, Inc. (800-999-3959)
 - d. "ADCOR® 500" system with all Mastics and adhesives by GRACE, www.prerufe.com

2.7 VAPOR RETARDERS

- A. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, Size 57, with 100 percent passing a 1-1/2-inch (38-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

2.8 CURING AND SEALING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Material shall become an integral part of concrete surface and leave floor free of residue or film.
 - 2. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 3. Approved Manufacturers:
 - a. "Eucobar"; Euclid Chemical Co, An RPM Company; (800-321-7628)
 - b. "Confilm"; BASF Building Systems (800-433-9517)
 - c. "SikaFilm"; Sika Construction Products Division, Sika Corporation (800-933-7452)
 - d. "Cimfilm"; Axim Italcementi Group, Inc. (800-899-8795)
 - 4. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C171, .006 inch (6 mil) thick, polyethylene film or white burlap-polyethylene sheet.

- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. "Clearseal WB 150"; Euclid Chemical Co, An RPM Company; (800-321-7628)
 - b. "Aqua Cure VOX - USA"; Euclid Chemical Co, An RPM Company; (800-321-7628)
 - c. Cure & Seal 1315 EF, Dayton Superior
 - d. "Kure-N-Seal WB"; BASF Building Systems (800-433-9517)
 - e. "Kure 200W"; Sonneborn Brand of BASF Building Systems (800-433-9517)
- E. Clear, Waterborne, Curing and Sealing Compound: ASTM C1315, 25 percent solids minimum.
 - 1. Drawing Designation: "SC-1"
 - 2. Approved Manufacturers:
 - a. "Super Aqua Cure VOX" - USA; Euclid Chemical Co, An RPM Company; (800-321-7628)
 - b. "Clearseal WB 300"; Euclid Chemical Co, An RPM Company; (800-321-7628)
 - c. "Kure 1315"; Sonneborn Brand of BASF Building Systems (800-433-9517)

2.9 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber, or ASTM D1752, cork or self-expanding cork.
- B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D2240.
- C. Polyurea Joint Filler: Two-component, 100 percent solids, with a Shore A hardness of 80 per ASTM D2240.
- D. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- E. Epoxy-Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- F. Reglets: Fabricate reglets of not less than 0.0217-inch (0.55-mm-) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- G. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 -inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

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2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from **1/8 -inch (3.2 mm)** and that can be feathered at edges to match adjacent floor elevations.
1. Application:
 - a. Refer to Drawings.
 - b. Existing concrete slab where existing tile flooring was removed.
 2. General:
 - a. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
 - b. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - c. Aggregate: Well-graded, washed gravel, **1/8 -inch** to **1/4 -inch (3 to 6 mm)** or coarse sand as recommended by underlayment manufacturer.
 - d. Compressive Strength: Not less than **4100 psi (29 MPa)** at 28 days when tested according to ASTM C109/C109M.
 3. Mfgr: Basis of design shall be **ARDEX TRM™ Transportaion Repair Mortar** as manufactured by **ARDEX** Engineered Cements, www.ardex.com
- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from **1/4 -inch (6 mm)**.
1. Application:
 - a. Refer to Drawings.
 - b. Existing concrete slab where existing tile flooring was removed and trwatede with Ardex TRM™.
 2. General:
 - a. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
 - b. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - c. Aggregate: Well-graded, washed gravel, **1/8 -inch** to **1/4 -inch (3 to 6 mm)** or coarse sand as recommended by topping manufacturer.
 - d. Compressive Strength: Not less than **5700 psi (39 MPa)** at 28 days when tested according to ASTM C109/C109M.
 3. Mfgr: Basis of design shall be **ARDEX CD™ Concrete Dressing** as manufactured by **ARDEX** Engineered Cements, www.ardex.com

2.11 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

- C. Proportion concrete mix for each class of concrete to achieve the strengths (28 days) and slumps noted on the drawings.
- D. Cementitious Materials:
 - 1. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - a. Fly Ash: **25 percent**, maximum.
- E. Maximum Water-Cementitious Materials Ratio:
 - 1. **0.40 to 0.42 maximum** for the following locations:
 - a. All concrete
- F. Compressive strength:
 - 1. **6000 psi**, unless indicated otherwise in Structural Drawings and approved by Architect and Structural Engineer.
- G. Limit water-soluble, chloride-ion content in hardened concrete to **0.15 percent** by weight of cement.
- H. Micro-Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than **1 lb/cu. yd.**
- I. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below **0.42**.
 - 4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94 and ASTM C1116, and furnish batch ticket information.
 - 1. When air temperature is between **85 and 90 deg F (30 and 32 deg C)**, reduce mixing and delivery time from **1-1/2 hours to 75 minutes**; when air temperature is above **90 deg F (32 deg C)**, reduce mixing and delivery time to **60 minutes**.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of **1 cu. yd. (0.76 cu. m)** or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.

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2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 1. Class A, 1/8 -inch (3 mm).
 2. Class B, 1/4 -inch (6 mm).
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete unless otherwise noted or detailed on drawings.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.
- B. Embedded items shall be located so as not to reduce the strength of the construction. They shall be thoroughly clean and free from coating, rust, scale, oil and other foreign material. No wood shall be permanently embedded in concrete.
- C. Embedments shall be maintained in position and protected until the concreting is complete.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. At least 70 percent of 28-day or 56 day design compressive strength.
 - 2. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
 - 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Owner's Representative Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

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- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Owner's Representative.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 -inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of **1/8 -inch (3 mm)**. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut **1/8 -inch (3-mm-)** wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than **1/2 -inch (12 mm)** or more than **1 -inch (25 mm)** below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Owner's Representative and Architect.
- C. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section

cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

- E. Deposit concrete in forms in horizontal layers no deeper than **24 -inches (600 mm)** and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least **6 -inches (150 mm)** into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below **90 deg F (32 deg C)** at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Refer to Section 03 1000 "Concrete Forming and Accessories"

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Refer to Section 03 3500 "Concrete Finishing".

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Other than specified in Section 32 1316 "Decorative Cement Concrete Paving", provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching **0.2 lb/sq. ft. x h (1 kg/sq. m x h)** before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with **12-inch (300-mm)** lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least **12 -inches (300 mm)**, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
4. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
5. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
6. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Restrictions on use: Do not use curing compound on surfaces over which homogeneous sheet material will be applied. For surfaces to receive other finishes, submit well in advance of time for curing application, written acceptance of curing compound by both the manufacturer and the installer of the finish material, relative to compatibility therewith of finish material, including primers, adhesives, and similar materials. If manufacturer of finish material has not been determined, Contractor shall be responsible for coordinating such acceptance.
7. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Owner's Representative. Remove and replace concrete that cannot be repaired and patched to Owner's Representative approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 -inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with

- water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Owner's Representative.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 -inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 -inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 -inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 -inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 -inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Owner's Representative's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Owner's Representative's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - 2. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 4. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 5. When frequency of testing will provide fewer than five compressive-strength tests
Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C39; test two laboratory-cured specimens at 7 days and two at 28 days and two at 56 days.
 - a. Test two field-cured specimens at 7 days and two at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
 - c. Upon (3) three additional test specimens may be required by the concrete subcontractor.
 - 1) Coordinate with contractor for total number of test specimens.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- E. Test results shall be reported in writing to Owner's Representative, Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day, 28-day and 56 –day tests.

- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Owner's Representative, Architect, but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Owner's Representative, Architect,. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Owner's Representative, Architect.

- END OF SECTION -

- SECTION 03 3500 -**CONCRETE FINISHING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, specific Specification Sections listed below, and all other Specification Sections apply to this Section.

1.2 SUMMARY

- A. Section includes material, labor, equipment, services, tests and inspections necessary for the finishing for cast-in-place concrete, slabs-on-grade, suspended slabs and including;
 - 1. Form facings.
 - 2. Reinforcing accessories.
 - 3. Reinforcement accessories.
 - 4. Finishes.
 - 5. Flatness and levelness standards.
- B. Related work addressed in other sections including;
 - 1. Concrete Curing – refer to Section 03 3000 “Cast-In-Place Concrete”.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Refer also to Section 01 4339 “Mockup Requirements”.
- C. Refer also to Section 01 4553 “Façade Mockup Testing”.
- D. Section 01 6116 “Volatile Organic Compound (VOC) Restrictions”.
- E. Section 03 1000 “Concrete Formwork” for Concrete Forming and Accessories.
- F. Section 03 2000 “Concrete Reinforcement”.
- G. Section 03 3000 “Cast-In-Place Concrete”, Concrete Materials, Concrete Mixture Design, Placement Procedures, Tests and Inspections.
- H. Section 03 3300 “Architectural Cast-In-Place Concrete”, Concrete Surface Finish and Waterproofing Admixture.

- I. Section 07 2633 "Water Vapor Emission Control (Flooring)" for treatment of concrete slabs to receive applied flooring.
- J. Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
- K. Pertinent sections of Division 32 specifying exterior concrete finishes.
- L. Pertinent sections of other Divisions specifying floor finishes installed over concrete.

1.4 REFERENCES

- A. Codes and Standards: Comply with the provisions of the documents listed below and with the requirements described in this Section.
 - 1. Use current editions of documents unless earlier editions are specifically referenced by the governing code or are otherwise indicated.
- B. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- C. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010 (ADA).
- D. ACI - American Concrete Institute, Manual of Concrete Practice, including, but not limited to, the following sections:
 - 1. ACI 117 "Standard Specifications for Tolerances for Concrete Construction and Materials".
 - 2. ACI 301 "Specification for Structural Concrete for Buildings".
 - 3. ACI 302.1R "Guide for Concrete Floor and Slab Construction".
 - 4. ACI 347 "Guide to Formwork for Concrete".
- E. ASTM, American Society for Testing and Materials, designations referenced herein.

1.5 DEFINITIONS

- A. Floor Flatness: (FACE Standards, F-number system. ASTM E1155.
 - 1. F_F : Floor Flatness.
 - 2. F_L : Floor Levelness.
- B. SOV: Surface Overall Value, as measured according to ASTM E1155 procedures.
- C. MLV: Minimum Local Value, as measured according to ASTM E1155 procedures.
- D. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.
 - 1. Refer also to Section 03 3300 "Architectural Cast-In-Place Concrete".
- E. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

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- F. Defective Finished Surfaces: Architectural concrete surfaces, including slabs, not meeting requirements of this section, as determined by the Architect.
- G. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.
- H. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.
- I. Surface Finishes as follows:
1. Surface Finish-1.0 (SF-1.0).
 - a. No formwork facing material is specified.
 - b. Patch voids larger than 1-1/2 -inch wide or 1/2 -inch deep.
 - c. Remove projections larger than 1 inch.
 - d. Tie holes need not be patched.
 - e. Surface tolerance Class D as specified in ACI 117.
 - f. Mockup not required.
 2. Surface Finish-2.0 (SF-2.0).
 - a. Patch voids larger than 3/4 -inch wide or 1/2 -inch deep.
 - 1) Voids deeper than rebar clear cover shall be Submitted to EOR for Approval.
 - b. Remove projections larger than 1/4 -inch.
 - c. Patch tie holes.
 - d. Surface tolerance Class B as specified in ACI 117.
 - e. Unless otherwise specified, provide mockup of concrete surface appearance and texture.
 3. Surface Finish-3.0 (SF-3.0).
 - a. Patch voids larger than 3/4 -inch wide or 1/2 -inch deep.
 - b. Remove projections larger than 1/8 -inch.
 - c. Patch tie holes.
 - d. Surface tolerance Class A as specified in ACI 117.
 - e. Provide mockup of concrete surface appearance and texture.

1.6 ACTION SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- C. Shop Drawings: Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.
 2. Coordinate with Section 03 3000 "Cast-In-Place Concrete".

- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Samples for Verification: Architectural concrete Samples, cast vertically, approximately **18 – inches** by **18 –inches** by **2 -inches** (**450 mm by 450 mm by 50 mm**), of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.
 - 1. Coordinate with Section 03 3000 “Cast-in-Place Concrete”.
- F. Sample panels: Refer to Section 03 3000 “Cast-in-Place Concrete” for sample panel submittal requirements.
- G. Mock-up: Refer to Section 03 3000 “Cast-in-Place Concrete” for mock-up submittal requirements.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and testing agency.
- B. Material Certificates: For each of the following:
 - 1. Repair materials.
- C. Material Test Reports: For the following, by a qualified testing agency:
 - 1. Aggregate: Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "NRMCA Quality Control Manual - Section 3, Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548 and approved by City of Phoenix (or authority having jurisdiction).
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to

provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.

- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 6, "Architectural Concrete."
 - 2. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."
- F. Concrete Testing Service: Owner shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, cast vertically, approximately 48 -inches by 48 -inches by 6 -inches (1200 mm by 1200 mm by 150 mm) minimum, to demonstrate the expected range of finish, color, and texture variations.
 - 1. Locate panels as indicated or, if not indicated, as directed by Architect.
 - 2. Demonstrate methods of curing, aggregate exposure, sealers, and coatings, as applicable.
 - 3. In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
 - 4. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - 5. Demolish and remove field sample panels when directed.
 - 6. Refer also to Section 01 4339 "Mockup Requirements".
 - 7. Refer also to Section 01 4553 "Façade Mockup Testing".
- H. Mockups: Before casting architectural concrete slab-on-grade and formed-surface panels, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Build mockups of typical exterior wall, including site walls and planters, of cast-in-place architectural concrete as shown on Drawings.
 - 3. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
 - 4. In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
 - 5. Obtain Architect's approval of mockups before casting architectural concrete.
 - 6. Refer also to Section 01 4339 "Mockup Requirements".

1.9 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Before submitting design mixtures, review concrete design mixture and examine

- procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place architectural concrete to attend, including the following:
- a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Cast-in-place architectural concrete subcontractor.
 - e. Special concrete finish subcontractor.
2. Review special inspection and testing and inspecting agency procedures for:
- a. Field quality control.
 - b. Concrete finishes and finishing.
 - c. Cold- and hot-weather concreting procedures.
 - d. Curing procedures.
 - e. Construction contraction and isolation joints.
 - f. Joint-filler strips.
 - g. Semi-rigid joint fillers.
 - h. Forms and form removal limitations.
 - i. Shoring and reshoring procedures.
 - j. Vapor-retarder installation.
 - k. Anchor rod and anchorage device installation tolerances.
 - l. Steel reinforcement installation.
 - m. Floor and slab flatness and levelness measurement.
 - n. Concrete repair procedures.
 - o. Concrete protection.
3. Review concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place Architectural concrete.

1.10 TESTS AND INSPECTIONS

- A. Notification:
1. The Contractor shall notify the Owner's Testing Agency of work to be tested and inspected.
 - a. Notification shall be sufficiently in advance to allow scheduling of tests and inspections, but not less than 24 hours.
 2. The Contractor shall immediately notify the Architect if the Owner's Testing Agency indicates that quality assurance tests and inspection requirements have not been met.
- B. Owner's Quality Assurance Tests and Inspections:
1. General: Quality assurance tests and inspections shall be the responsibility of the Owner. The Owner shall retain a testing agency, referred to herein as the Owner's Testing Agency, who shall perform the required tests and inspections, prepare written summary reports of tests and inspections, and review submittals.
 2. Formed Surface Finish: Inspect cast finish of formed surfaces for compliance with applicable class A, B, C or D surface as defined in ACI 347.

3. Slab Finish Tolerance: Measure slab tolerance by 10-foot straightedge or measure floor flatness and levelness by ASTM E 1155 to confirm that specification limits herein have been satisfied.

1.11 PROTECTION OF MATERIALS

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 FORM-FACING MATERIALS

- A. General: Comply with Section 03 1000 "Concrete Forming and Accessories" for formwork and other form-facing material requirements.
- B. Form-Facing Panels for As-Cast Finishes: Steel, glass-fiber-reinforced plastic, or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- C. Form-Facing Panels for As-Cast Finishes:
 1. Refer to and comply with Section 03 1000 "Concrete Forming and Accessories" and complying with DOC PS 1.

2.3 STEEL REINFORCEMENT AND ACCESSORIES

- A. General: Comply with Section 03 2000 "Concrete Reinforcing" for steel reinforcement and other requirements for reinforcement accessories.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice".
 1. Where legs of wire bar supports contact forms, use color-compatible bar supports.

2.4 CONCRETE MATERIALS

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete" for cementitious materials and other requirements for admixtures and aggregates.
- B. Cementitious Material: Use cementitious materials, of the same type, brand, and source, throughout Project:

- C. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.
- D. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.5 CURING MATERIALS

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete" for curing materials and other requirements for curing.

2.6 REPAIR MATERIALS

- A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- C. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 -inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 -inch to 1/4 -inch (3.2 mm to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 6000 psi at 28 days when tested according to ASTM C 109/C 109M.
- D. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 -inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 -inch to 1/4 -inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 6000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.7 ACCESSORY PRODUCTS

- A. Evaporation reducing compounds: Film-forming compound for temporary protection from rapid moisture loss. Acceptable products include:
 - 1. "Confilm" by BASF.
 - 2. "Eucobar" by Euclid Chemical Co.
 - 3. Substitutions: Section 01 2500.

2.8 LIQUID FLOOR TREATMENTS

- A. Surface Hardener / Sealer: Water-based chemically-reactive penetrating sealer and hardener, that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, while allowing concrete to achieve full compressive strength, minimizing surface crazing, and eliminating dusting.
 - 1. Colorless, transparent, odorless, non-toxic, non-flammable.
 - 2. Containing no solvents or volatile organic compounds.
 - 3. Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months.
 - 4. No change to surface appearance except a sheen developed due to traffic and cleaning.
 - 5. Acceptable products include:
 - a. "Ashford Formula", Curecrete Chemical Company, Orem Utah;
 - b. Substitutions: Section 01 2500.

2.9 CONCRETE MIXTURES, GENERAL

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete".

2.10 CONCRETE MIXING

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete".

PART 3 - EXECUTION**3.1 PROTECTION OF MATERIALS**

- A. Protect materials from damage, weather, and contaminants such as grease, oil, and dirt.

3.2 PERFORMANCE REQUIREMENTS

- A. VOC Limits for all adhesives, sealants, fillers and primers. Comply with limits specified in Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Provide products with highest levels of post-consumer and pre-consumer recycled content.

3.3 FORMWORK – ARCHITECTURAL CONCRETE

- A. General: Comply with Section 03 1000 "Concrete Forming and Accessories" for formwork, embedded items, and shoring and reshoring.
- B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- C. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place Architectural Concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 -inch (3.2 mm).
- D. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 1. In addition to ACI 117, comply with the following tolerances:
 - 2. Conform to ACI 347 Finish Classes in locations listed in the Finish Schedule at the end of this section.
 - 3. Irregularity Limits: Do not exceed values specified in ACI 347 Table 3.1 (below) for permitted abrupt and gradual irregularities as measured within a five foot (1.5m) length with a straightedge.

Class of Surface (ACI 347 Table 3.1)

A	B	C	D
1/8 -inch (3 mm)	1/4 -inch (6 mm)	1/2 -inch (13 mm)	1 -inch (25 mm)

- 4. Allowable irregularities are designated either abrupt or gradual. Offsets and fins resulting from displaced, mismatched, or misplaced forms, sheathing, or liners or from defects in forming materials are considered abrupt irregularities. Irregularities resulting from warping and similar uniform variations from planeness or true curvature are considered gradual irregularities. Gradual irregularities shall be checked with a straightedge for plane surfaces or a shaped template for curved or warped surfaces. In measuring irregularities, the straightedge or template can be placed anywhere on the surface in any direction.
- 5. Provide concrete surface tolerances as specified in ACI 301 otherwise.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
 - 1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
 - 2. Do not use rust-stained steel form-facing material.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Detail exterior corners and edges of cast-in-place architectural concrete as shown on Drawings.
- H. Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.

- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- M. Coat contact surfaces of forms with surface retarder, according to manufacturer's written instructions, before placing reinforcement.

3.4 REINFORCEMENT AND INSERTS

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete" and 03 2000: Concrete Reinforcing" for fabricating and installing steel reinforcement.
 - 1. Securely fasten steel reinforcement and wire ties against sheathing during concrete placement.
- B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.5 REMOVING AND REUSING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than **50 deg F (10 deg C)** for 24 hours after placing concrete if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Schedule form removal to maintain surface appearance that matches approved mockups.
 - 2. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.
- B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place as specified in Section 03 1000 "Concrete Forming and Accessories" and Section 03 3000 "Cast-In-Place Concrete".
- C. Clean and repair surfaces of forms to be reused in the Work.
 - 1. Do not use split, frayed, delaminated, or otherwise damaged form-facing material.
 - a. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
 - 1. Align and secure joints to avoid offsets.
 - 2. Do not use patched forms for cast-in-place architectural concrete surfaces.

3.6 JOINTS

- A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
 2. Form keyed joints as indicated. Align construction joint within rustications attached to form-facing material.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.7 CONCRETE PLACEMENT

- A. General: Comply with Section 03 3000 "Cast-in-Place Concrete" and the following for placing Architectural Concrete.
- B. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- D. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least **6 inches (150 mm)** into preceding layer.
 - a. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - b. Do not permit vibrators to contact forms.
- E. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below **90 deg F (32 deg C)** at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

CONCRETE FINISHING

3.8 FINISHES, GENERAL

- A. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.
 - 1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- B. Maintain uniformity of special finishes over construction joints unless otherwise indicated.
- C. Architectural Concrete Finish: Match matches approved mockups identified and described as indicated, to satisfaction of Architect.

3.9 AS-CAST FORMED FINISHES

- A. Perform subsequent finishing operations as soon as practical after stripping formwork, except as specifically noted.
- B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding specified limits on formed-surface irregularities.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- D. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.
- E. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects.
 - 1. Architectural Concrete: Smooth-Formed finish and as follows:
 - a. No facing materials with raised grain.
 - b. Facing materials set in orderly and symmetrical arrangement, demonstrated in shop drawings.
 - c. Minimize seams.

3.10 CAST-IN-PLACE CONCRETE SLAB FINISHES

- A. General: Comply with ACI 302.1R recommendations for screeding, floating, restraightening, and finishing operations for slabs.
 - 1. Do not wet concrete surfaces.
- B. Evaporation Control: Protect concrete from rapid moisture loss before and during finishing operations. Apply evaporation control material prior to the commencement of finishing operations and periodically during finishing as needed. Do not apply water to the slab surface prior to the completion of finishing operations.

- C. **Measurement of Slab Tolerances:** Measure slab finish tolerances within 72 hours after slab finishing and before removal of supporting formwork or shoring. Use the specified method and tolerance listed for each type of finish.
- D. **Scratch Finish:** Finish for monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious finish flooring material, as indicated on architectural drawings. While still plastic, screed and bullfloat concrete surface. Roughen the surface with stiff brushes or rakes to produce a profile of **1/4 -inch** in one direction before final set of concrete.
1. Finish Tolerance: **1/2 -inch in 10-feet** measured by "**10-feet** straightedge method" in ACI 117.
- E. **Float Finish:** Finish for monolithic slab surfaces to be covered with unbonded topping, built-up waterproofing, terrazzo as indicated on architectural drawings. Screed and bullfloat concrete surface. Consolidate surface with power-driven floats or by hand floating if area is too small or inaccessible by power-driven floats. Restraighten, cut down high spots and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Finish Tolerance: **5/16 -inch in 10 -feet** measured by "**10 -feet** straightedge method" in ACI 117.
- F. **Light Trowel Finish:** Finish for interior floor slab surfaces to be covered with carpet, resilient flooring, or thin-set tile or slab surfaces to receive fluid-applied waterproofing. Apply float finish. Consolidate concrete surface by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks, uniform in texture, and planed to the specified tolerance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Finish Tolerance:
 - a. When slab is not sloped and total project area is greater than **10,000 square feet**, use the F-number system as measured by ASTM E 1155 with tolerances as follows:
 - 1) Flatness: Overall F_F 30; with a minimum local value of F_F 24.
 - 2) Levelness: Overall F_L 20; with a minimum local value of F_L 15.
 - b. Otherwise, use **3/16 -inch in 10 -feet** measured by "**10-feet** straightedge method" in ACI 117.
- G. **Hard Trowel Finish:** Finish for slabs exposed to view, mechanical rooms, and storage areas. Apply light trowel finish. Continue hand troweling until a ringing sound is produced as the trowel is moved over the surface. Final hand-troweling shall leave finished surface free of trowel marks, uniform in texture and appearance, and planed to the specified tolerance.
1. Finish Tolerance:
 - a. When slab is not sloped and total project area is greater than 10,000 square feet, use the F-number system as measured by ASTM E 1155 with tolerances as follows:
 - 1) Carpeted slabs: Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
 - 2) Slabs on Grade: Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.
 - 3) Suspended Slabs: Specified overall values of flatness, F_F 30; and of

levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.

- b. Otherwise, use 3/16 -inch in 10 -feet measured by "10-feet straightedge method" in ACI 117.

H. Broom Finish: Finish for exterior surfaces. Apply float finish. Lightly steel trowel to remove irregularities. Roughen surface by drawing a fiber bristle broom, not less than 24 inches wide, across surface perpendicular to main traffic route. Produce even texture from edge to edge, lapping adjacent strokes slightly to produce a uniform pattern.

1. Finish Tolerance: 5/16 -inch in 10 -feet measured by "10-feet straightedge method" in ACI 117.
2. Obtain Architect's approval for texture of final finish before application.

I. Swirl Finish: Finish for parking surfaces. Apply float finish. Hand float using a wood float to produce a continuous swirls patterned surface, free from porous and rough spots that may be produced by disturbing particles of coarse, aggregate embedded near the surface.

1. Finish Tolerance: 5/16 -inch in 10 -feet measured by "10-feet straightedge method" in ACI 117.
2. Obtain Architect's approval for texture and pattern of final finish before application.

J. Slip-Resistive Finish: Finish for slabs exposed to view, ramps, stair landings and treads. Apply initial float finish. Before final floating, apply slip-resistive aggregate or aluminum granule according to manufacturer's written instructions. Minimum rate of application shall be 25lbs/100SF. Follow spreading and tamping of slip-resistive aggregate with a final float, but do not force below surface and apply a light trowel finish. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive material.

1. Finish Tolerance: 5/16 -inch in 10 -feet measured by "10-feet straightedge method" in ACI 117.

K. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. feet. unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 for hot-weather protection during curing.

B. Begin curing cast-in-place architectural concrete immediately after removing forms from or applying as-cast formed finishes to concrete. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:

1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for no fewer than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12 -inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 -inches (300 mm), and sealed by waterproof tape or adhesive.
 - b. Cure for no fewer than (7) seven days.
 - c. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.
3. Curing Compound:
 - a. Mist concrete surfaces with water.
 - b. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions.
 - c. Recoat areas subjected to heavy rainfall within three hours after initial application.
 - d. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Apply in accordance with manufacturer's instructions.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
 - a. Rinse with water; remove excess material until surface is dry.
 - b. Apply a second coat in a similar manner if surface is rough or porous.

3.13 REPAIRS

- A. Repair and cure defective finished surfaces of cast-in-place architectural concrete only when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.
 1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.
- B. Contractor shall propose repair methods for Architect's approval, and perform proposed repair testing on approved mockups before repairing permanent work.
 1. Patch a test area on approved mockup location(s) to verify mixture and color match before proceeding with patching.
 2. Obtain Architect's written approval of repair method before commencing permanent repair.
 3. Revise reject repair methods and re-submit, or at Architect's option, replace defective concrete.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than **1/2 -inch (13 mm)** in any dimension to solid concrete. Limit cut depth to **3/4 -inch (19 mm)**. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of **0.01 -inch (0.25 mm)** wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - a. As approved by Architect.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of **1/4 -inch (6 mm)** to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - a. As approved by Architect.
 6. Repair defective areas, except random cracks and single holes **1 -inch (25 mm)** or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a **3/4-inch (19-mm)** clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes **1 -inch (25 mm)** or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 PROTECTION, AND CLEANING

- A. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.
- B. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.
- C. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
- D. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.
 - 1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.
- E. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

3.15 FINISH SCHEDULE

- A. The concrete finish types specified in the tables below shall be used except as otherwise shown on the Drawings.
- B. Refer to the section titled "Concrete Forming" for formwork requirements.

Table 1: Finishes for Formed Surfaces

Surface Type	Formed Concrete Surfaces	Un-formed Surfaces
Concealed	Rough Form Finish Surface Finish-1.0 ACI 347 Class D	Natural Rod Finish
To receive waterproofing or cement plaster	Smooth Form Finish, Surface Finish-2.0 ACI 347 Class B	Steel Trowel Finish
Pits (inside face)	Smooth Form Finish, Surface Finish-3.0 ACI 347 Class C	Steel Trowel Finish
Exposed to view, building interior, unless otherwise noted	Architectural Concrete Smooth Form Finish; Surface Finish-3.0 ACI 347 Class A	Steel Trowel Finish
Exposed to view, mechanical rooms and storage areas	Smooth Form Finish, Surface Finish-3.0 ACI 347 Class C	Steel Trowel Finish
Exposed to view, slab soffits	ACI 347 Class A Architectural Concrete, Smooth Form Finish, Surface Finish-3.0	Not Applicable
Architectural Concrete Surfaces	Architectural Concrete Smooth Form Finish, Surface Finish-3.0 ACI 347 Class A	Architectural Finish

3.16 SURFACE HARDENER SEALER

- A. Treat loading dock slab, sally port and interior slabs where scheduled.
- B. Do not install surface hardener sealer on surfaces scheduled to receive finishes specified in other sections.
- C. Install in accordance with manufacturer's instructions after recommended minimum cure period.

3.17 CORRECTION OF DEFECTIVE WORK

- A. Correction of defective work shall be the responsibility of the Contractor.
- B. Work not in compliance with the requirements of the Contract Documents shall be considered defective, unless otherwise directed in writing by the Architect.
- C. Corrected work shall conform to the requirements of the Contract Documents.
- D. The Contractor shall prepare a submittal documenting the defective work and proposed corrections and submit to the Architect for review. The submittal shall include a description of the defective work, the location of defective work, and shall be accompanied by supporting sketches, photographs, or both. Additionally, the submittal shall include similar documentation of the Contractor's proposed corrections.
- E. Correction of defective work shall not commence until the Architect has reviewed and accepted the submittal.
- F. Correction of defective work shall be inspected by the Owner's Testing Agency.

3.18 CLEAN-UP

- A. Remove from the site all debris resulting from the work of this Section.

- END OF SECTION -

- SECTION 03 3719 -**PNEUMATICALLY PLACED CONCRETE
(SWIMMING POOLS)**

PART 1 - GENERAL**1.1 DESCRIPTION**

- A. Work in this section. Principal items include:
 - 1. Shotcrete for swimming pool and spa structure.
 - 2. Preparation of surfaces to receive shotcrete.
 - 3. Forms and ground wires.
 - 4. Furnishing and placing reinforcing steel for shotcrete.
 - 5. Mixing, delivery, placing, finishing and curing of shotcrete.
 - 6. Protection and cleaning of adjacent surfaces.
- B. Related sections:
 - 1. 07 1413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for building waterproofing prior to additional waterproofing specific to swimming pools
 - 2. 07 1416 "Cold Fluid-Applied Waterproofing (Swimming Pool)" for additional waterproofing at swimming pools
 - 3. 09 3013 "Swimming Pool Ceramic Tile"
 - 4. 09 9723 "Concrete and Masonry Coatings (Swimming Pool)"
 - 5. 13 1133 "Elevated Swimming Pool"
 - 6. 13 1146 "Swimming Pool Accessories"
 - 7. 13 1149 "Swimming Pool Cleaning Equipment"

1.2 QUALITY ASSURANCE

- A. Qualifications of shotcrete subcontractor: proposed subcontractor shall have at least 5 years experience in structural shotcrete construction and have constructed at least 20 significant structural shotcrete swimming pools and spas, which, on investigation, have been found to be completed in satisfactory manner.
- B. Reference standards: Except as modified by requirements of contract documents, shotcrete work shall conform to requirements of ACI 506.
- C. ACI Certified Nozzle man (Vertical Placement) required placing shotcrete. Submit copy of certification with bid to General Contractor.

- D. ACI certified examiner required for this project. Contractor shall provide "Inspection of Record" detailing shotcrete placement and reinforcement verification. Rebound or spoils not permitted in any area of the pool. Contact Chris Zynda at 1-408-640-6219, CZYNDA@JJABANESE.COM.
- E. Note: This specification is contingent on review and approval of licensed structural engineer.

1.3 SUBMITTALS

- A. Conform to Division 1 requirements. Submit shop drawings for complete pool and spa structure including complete and detailed reinforcing steel bending and layout diagrams. Provide structural plans approved for commercial pools and spas, carrying approval and stamp of Structural Engineer registered in State of Arizona.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Form lumber: WCLIB "Construction" grade or better, WWP A No. 1 or better.
- B. Form plywood: PS 1-83, Group 1, Exterior grade B_B plyform or better, minimum 5 ply and 5/8 - inch thickness.
- C. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type or equal, not leaving metal within 1-1/2 -inch of shotcrete surface.
- D. Form coatings: Resin-type coating free of oil, silicone, wax, and non-drying material.

2.2 REINFORCING STEEL

- A. Reinforcing bars, ASTM A615, including supplementary requirement (S1), Grade 40, deformed.
- B. Welded wire fabric: ASTM A185, wire fabric size and gauge as shown. 60 ksi minimum tensile strength.
- C. Tie Wire: annealed copper-bearing steel, 16-gauge minimum.
- D. Welding electrodes: AWS D1.4, Table 5.1, low hydrogen electrodes, E9018 for grade 40 steel.

2.3 SHOTCRETE MATERIALS

- A. Cement
 - 1. Portland cement: ASTM C150, Type II, low alkali.
 - a. Fly Ash: Fly Ash shall be ASTM C 618 class F fly ash with loss of ignition of five percent or less. Maximum fly ash content shall be limited to 25 percent of total cementitious material weight.

- b. Ground Granulated Blast Furnace Slag (GGBFS): GGBFS shall meet ASTM C 989-99 Ground Granulated Blast Furnace Slag for Use in Concrete. Maximum GGBFS content shall be limited to 50 percent of total cementitious weight. Maximum total combined GGBFS and fly ash shall be limited to 50% of total cementitious material weight.

B. Aggregate

1. Normal weight aggregate: ASTM C 33. Aggregate not meeting ASTM C 33 may be used provided preconstruction tests, demonstrate shotcrete can meet specified requirements.
2. Water Clean and potable. Mixing water for shotcrete shall meet requirements of ASTM C 94.
3. Admixtures
 - 1) Water-reducing: ASTM C 1141
 - 2) Retarding: ASTM C 1141
 - 3) Accelerating: ASTM C 1141
 - 4) Air-entraining: ASTM C 1141
 - 5) Fly ash and natural pozzolans: ASTM C 618
 - 6) Ground granulated blast-furnace slag: ASTM C 989
 - 7) Silica fume: ASTM C 1240

2.4 QUALITY ASSURANCE/CONTROL

A. Test Panels

1. Concrete design strength is based on cast concrete cylinders. Shotcrete design strength, however, is based on cores or sawed cubes taken from sample test panel. Core sample strength, however, is expected to be 0.85 of cast cylinder strength (ACI 318 paragraph 5.6) since core samples are disturbed due to coring or cutting process. Testing should be done in accordance with ASTM C 1140-98 Preparing and Testing Specimens from Shotcrete Test Panels.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

- A. If sloughing or caving of earth banks occurs, fill resulting voids with shotcrete at no extra cost to owner, back-filling voids with earth is not permitted. Dampen concrete and earth surfaces before shotcrete is deposited, but not so wet as to overcome suction.

3.2 PROTECTION

- A. Protect surfaces not receiving shotcrete from over spray. Repair damages as required by owner at no cost to owner.

3.3 SHOTCRETE QUALITY

- A. Accurately control proportion of water to Portland cement to produce thorough and uniform hydration of shotcrete that, when shot, forms homogeneous mass containing neither sags nor dry sand formation.
- B. Strength: Minimum 4,000 psi 28-day compressive strength unless otherwise indicated.
- C. Slump: Measured at point of discharge from mixer shall be minimum 1-1/2 -inches and maximum 2-1/2 -inches.

3.4 CURING

- A. Provide moisture cure. Apply constant water coating in fog-mist spray without damage to surface texture. Keep shotcrete continuously moist for not less than 7 days after placing. Use sealed curing sheeting or other approved curing method where water curing is not feasible. Use of curing compounds is prohibited.

3.5 DEFECTIVE SHOTCRETE

- A. Cut out and replace defective shotcrete including rebound, sand pockets, sags, sloughing, and other defects at no extra cost to owner

- END OF SECTION -

- SECTION 03 3816 -**UNBONDED POST-TENSIONED CONCRETE**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section Includes:
 - 1. Post-tensioning reinforcement and accessories including prestressing tendons, pocket formers, support bars, bar chairs, and slab bolsters.
 - 2. Post-tensioning operations including stressing, recording tendon elongations and gage pressures, and finishing tendons.

1.3 DEFINITIONS

- A. Strand Tail: Excess strand length extending past the anchorage device.
- B. Stressing Pocket: Void formed by pocket former at stressing-end anchorage to provide required cover over wedges and strand tail.
- C. Wedge Cavity: Cone-shaped hole in anchorage device designed to hold the wedges that anchor the strand.

1.4 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3500 "Concrete Finishing"
- C. Section 07 8413 "Penetration Firestopping" for sealing joints in fire-resistance-rated construction.
- D. Section 07 8446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.

1.5 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.6 COORDINATION

- A. Attachments and Penetrations:
 - 1. Attach permanent construction such as curtain-wall systems, handrails, fire-protection equipment, lights, and security devices to the post-tensioned slab using embedded anchors.
 - 2. Drilled anchors, power-driven fasteners, and core drilling for sleeves or other penetrations are not allowed unless authorized in writing by Architect.
 - 3. Form penetrations within **18 -inches (460 mm)** of an anchorage with ASTM A 53/A 53M, Schedule 40 steel pipe.

1.7 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Review methods and procedures related to installation and stressing of post-tensioning tendons including, but not limited to, the following:
 - a. Construction schedule and availability of materials, personnel, and equipment needed to make progress and avoid delays.
 - b. Storage of post-tensioning materials on-site.
 - c. Structural load limitations.
 - d. Coordination of post-tensioning installation drawings and nonprestressed reinforcing steel placing drawings.
 - e. Horizontal and vertical tolerances on tendons and nonprestressed reinforcement placement.
 - f. Marking and measuring of elongations.
 - g. Submittal of stressing records and requirements for tendon finishing.
 - h. Removal of formwork.

1.8 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Post-tensioning coating.
 - 2. Tendon sheathing.
 - 3. Anchorage devices.
 - 4. Tendon couplers.
 - 5. Bar and tendon supports.
 - 6. Pocket formers.
 - 7. Sheathing repair tape.
 - 8. Stressing-pocket patching material.
 - 9. Encapsulation system.

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- B. Shop Drawings: Include the following, prepared by or under the supervision of a qualified professional engineer, detailing tendon layout and installation procedures:
1. Installation drawings including plans, elevations, sections, and details.
 2. Numbers, arrangement, and designation of post-tensioning tendons.
 3. Tendon profiles and method of tendon support including chair heights and locations. Show tendon profiles at sufficient scale to clearly indicate all support points, with their associated heights.
 4. Tendon anchorage details including bundled tendon flaring.
 5. Tendon clearances around slab openings and penetrations.
 6. Construction joint locations, pour sequence, locations of anchorages and blockouts required for stressing.
 7. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
 8. Calculated elongations for each tendon.
 9. Details for horizontal curvature around openings and at anchorages.
 10. Details for corners and other locations where tendon layouts may conflict with one another or nonprestressed reinforcing steel.
 11. Locations of nonprestressed reinforcement required for installing post-tensioning tendons including, but not limited to, the following:
 - a. Support bars.
 - b. Backup bars and hairpins at anchorages.
 - c. Hairpins at locations of horizontal curvature.
 - d. Supplemental reinforcement at blockouts.
- C. Samples: For the following products:
1. Each anchorage device assembly with a minimum of 24 -inches (610 mm) of coated, sheathed strand.
 2. Each coupler assembly with a minimum of 24 -inches (610 mm) of coated, sheathed strand.
 3. Components of the encapsulation system, unassembled and clearly identified.
- D. Delegated-Design Submittal: For post-tensioning system.
1. Sealed design calculations prepared by a qualified structural engineer indicating method of elongation calculation including values used for friction coefficients, anchorage seating loss, elastic shortening, creep, relaxation, and shrinkage.

1.9 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer . Include resume of individual supervising installation and stressing of post-tensioning tendons.
- B. Product Certificates:
1. For each type of anchorage device and coupler.
 2. For each type of encapsulation system.
- C. Mill Test Reports: Certified mill test reports for prestressing strand used on Project indicating that strand is low relaxation and including the following:

1. Coil numbers or identification.
 2. Breaking load.
 3. Load at 1 percent extension.
 4. Elongation at failure.
 5. Modulus of elasticity.
 6. Diameter and net area of strand.
- D. Field quality-control reports.
- E. Procedures Statement: Procedures for cutting excess strand tail and patching stressing pocket.
- F. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.
- G. Stressing Records: Submit the same day as stressing operations.
- H. Closeout Submittals:
1. Submit under provisions of Section 01 7700.

1.10 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."
- B. Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 - Field Fundamentals course or has equivalent verifiable experience and knowledge acceptable to Architect.
1. Superintendent must receive training from post-tensioning supplier in the operation of stressing equipment to be used on Project.
- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
1. Testing Agency Inspector: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 1 - Field Fundamentals course or shall have equivalent verifiable experience and knowledge acceptable to Architect.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. Immediately remove damaged components from Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain post-tensioning materials and equipment from single source.
 - 1. Stressing jacks not provided by post-tensioning supplier must be calibrated and approved for use on Project by post-tensioning supplier.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design post-tensioned reinforcement.
- B. Structural Performance: Design cast-in-place, post-tensioned concrete reinforcement as indicated in this Section. Show final effective forces, tendon profiles, and nonprestressed reinforcement on design installation drawings.
- C. Design structure to withstand the loads indicated according to governing codes, within limits and under conditions indicated.
- D. Average Precompression:
 - 1. Minimum Average Slab Precompression: 125 psi (0.86 MPa) .
 - 2. Maximum Average Slab Precompression: 300 psi (2.1 MPa) .
 - 3. Minimum Average Precompression in T-, L-, and Rectangular-Beam Cross Sections: 200 psi (1.4 MPa) .
 - 4. Minimum Precompression in Slab Section Not Included in T- or L-Beam Section: 100 psi (0.7 MPa) .
 - 5. Maximum Precompression in Transfer Girders: 1000 psi (6.9 MPa) . Specify stage-stressing sequence to avoid overstress.
- E. Comply with ACI 318 (ACI 318M) requirements unless more stringent requirements are indicated.
 - 1. Limits on stresses at transfer of prestress and under service load.
 - 2. Minimum bonded reinforcement.
 - 3. Concrete cover over reinforcement.
- F. Fire Resistance: Design members such that thickness and concrete cover over reinforcement comply with fire-resistance requirements of authorities having jurisdiction.
- G. Fire Resistance: Design members such that thickness and concrete cover over reinforcement comply with the following fire-resistance requirements:
 - 1. Slabs: One hours.
 - 2. Beam: Onehours.
- H. Deflection Limits Including Creep and Shrinkage Effects:
 - 1. Total Dead Load: L/600 .
 - 2. Total Dead Plus Live Load: L/360 .

2.3 PRESTRESSING TENDONS

- A. ACI Publications: Comply with ACI 423.6, "Specification for Unbonded Single Strand Tendons," unless otherwise indicated in the Contract Documents.
- B. Prestressing Strand: ASTM A 416/A 416M, **Grade 270 (Grade 1860)**, uncoated, seven-wire, low-relaxation, **0.5-inch- (12.7-mm-)** diameter strand.
- C. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.
 - 1. Minimum Coating Weight: **2.5 lb (1.14 kg)** for **0.5-inch (12.7-mm-)** diameter strand per **100 -feet (30 m)** of strand.
 - 2. Completely fill annular space between strand and sheathing over entire tendon length with post-tensioning coating.
- D. Tendon Sheathing:
 - 1. Minimum Thickness: **0.050 -inch (1.25 mm)** for polyethylene or polypropylene with a minimum density of **0.034 lb/cu. in. (0.9 g/cu. cm)**.
 - 2. Continuous over length of tendon to provide watertight encapsulation of strand and between anchorages to prevent intrusion of cement paste or loss of coating for a non-encapsulated system.
- E. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements and capable of developing 95 percent of actual breaking strength of strand.
 - 1. Anchorage Bearing Stresses: Comply with ACI 423.6 for stresses at transfer load and service load.
 - 2. Fixed-End Anchorage Device Assemblies: Plant fabricated with wedges seated at a load of not less than 80 percent and not more than 85 percent of breaking strength of strand.
- F. Encapsulation System: Watertight encapsulation of prestressing strand consisting of the following:
 - 1. Wedge-Cavity Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.
 - a. Caps for Fixed- and Stressing-End Anchorage Devices: Designed to provide watertight encapsulation of wedge cavity. Sized to allow required extension of strand past the wedges.
 - 1) Attach cap for fixed-end anchorage device in fabricating plant.
 - b. Caps at Intermediate Anchorages: Open to allow passage of strand.
 - 2. Sleeves: Attached to anchorage device with positive mechanical connection; overlapped a minimum of **4 -inches (100 mm)** with sheathing and completely filled with post-tensioning coating.

2.4 NONPRESTRESSED STEEL BARS

- A. Support Bars, Reinforcing Bars, Hairpins:
 - 1. Steel: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed for #3 and #4, ASTM A615, Grade 75 for #5 and larger, deformed.

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2. Low-Alloy Steel: ASTM A 706/A 706M, deformed.

B. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons and tendon support bars in place. Manufacture bar supports, according to CRSI's "Manual of Standard Practice," from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. For uncoated bars, use all-plastic or CRSI Class 1 plastic-protected bar supports.

2.5 ACCESSORIES

A. Pocket Formers: Capable of completely sealing wedge cavity; sized to provide the required cover over the anchorage and allow access for cutting strand tail.

B. Anchorage Fasteners: Galvanized -steel nails, wires, and screws used to attach anchorage devices to formwork.

C. Sheathing Repair Tape: Elastic, self-adhesive, moistureproof tape with minimum width of **2 - inches (50 mm)**, in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

- a. 3M; Tape 226.
- b. Adhesive Tape Products, Ltd; PWT-20.
- c. Covalence Adhesives; Polyken 826.

2.6 PATCHING MATERIAL

A. One-component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead applications. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

- a. Building Systems; Emaco R350 CI
- b. BASF Construction Chemicals - Building Systems; Emaco R350 CI.
- c. Euclid Chemical Company (The); an RPM company; Verticoat Supreme.
- d. Fox Industries, Inc.; FX-228.
- e. Kaufman Products, Inc; Patchwell Kit V/O.
- f. Sika Corporation; SikaMonoTop 611or SikaMonoTop 615.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Provide formwork for post-tensioned elements as specified Section 033000 "Cast-in-Place Concrete." Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber, or deflection resulting from application of prestressing force.
- B. Do not remove forms supporting post-tensioned elements until tendons have been fully stressed and elongations have been approved by Architect.
- C. Do not place concrete in supported floors until tendons on supporting floors have been stressed and elongations have been approved by Architect.

3.2 NONPRESTRESSED STEEL REINFORCEMENT PLACEMENT

- A. Placement of nonprestressed steel reinforcement is specified in Section 033000 "Cast-in-Place Concrete." Coordinate placement of nonprestressed steel reinforcement with installation of post-tensioning tendons.

3.3 TENDON INSTALLATION

- A. Install tendons according to installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
 - 1. Tolerances: Comply with tolerances in ACI 423.6 for beams and slabs.
- B. Tendon Supports: Provide continuous slab bolsters or bars supported on individual high chairs spaced at a maximum of **42 -inches (1070 mm)** o.c. to ensure tendons remain in their designated positions during construction operations and concrete placement.
 - 1. Support tendons as required to provide profiles shown on installation drawings. Position supports at high and low points and at intervals not exceeding **48 -inches (1220 mm)**. Ensure that tendon profiles between high and low points are smooth parabolic curves.
 - 2. Attach tendons to supporting chairs and reinforcement without damaging tendon sheathing.
 - 3. Support slab tendons independent of beam reinforcement.
- C. Maintain tendon profile within maximum allowable deviations from design profile as follows:
 - 1. **1/4 -inch (6.3 mm)** for member depth less than or equal to **8 -inches (200 mm)**.
 - 2. **3/8 -inch (9.5 mm)** for member depth greater than **8 -inches (200 mm)** and less than or equal to **24 -inches (610 mm)**.
 - 3. **1/2 -inch (13 mm)** for member depth greater than **24 -inches (610 mm)**.
- D. Maintain minimum radius of curvature of 480-strand diameters for lateral deviations to avoid openings, ducts, and embedded items. Maintain a minimum of **2 -inches (50 mm)** of separation between tendons at locations of curvature.

- E. Limit tendon bundles to five tendons. Do not twist or entwine tendons within a bundle. Maintain a minimum distance of **12 -inches (300 mm)** between center of adjacent bundles.
- F. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs. Obtain Architect's approval before relocating tendons or tendon anchorages that interfere with one another.
- G. Deviations in horizontal spacing and location of slab tendons are permitted when required to avoid openings and inserts.
- H. Installation of Anchorage Devices:
 - 1. Place anchorage devices at locations shown on approved installation drawings.
 - 2. Do not switch fixed- and stressing-end anchorage locations.
 - 3. Attach pocket formers, intermediate anchorage devices, and stressing-end anchorage devices securely to bulkhead forms. Install stressing-end and intermediate anchorage devices perpendicular to tendon axis.
 - 4. Install tendons straight, without vertical or horizontal curvature, for a minimum of **12 -inches (300 mm)** behind stressing-end and intermediate anchorages.
 - 5. Embed intermediate anchorage devices at construction joints in first concrete placed at joint.
 - 6. Minimum splice length in reinforcing bars at anchorages is **24 -inches (600 mm)**. Stagger splices a minimum of **60 -inches (1500 mm)**.
 - 7. Place fixed-end anchorage devices in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.
 - 8. Remove loose caps on fixed-end anchorages, refill with post-tensioning coating, and re-attach caps to achieve a watertight enclosure.
- I. Maintain minimum concrete cover as follows:
 - 1. From Exterior Edge of Concrete to Wedge Cavity: **1-1/2 -inches (38 mm)**.
 - 2. From Exterior Edge of Concrete to Strand Tail: **3/4 -inch (19 mm)**.
 - 3. From Exterior Edge of Concrete to Wedge-Cavity Cap: **1 -inch (25 mm)**.
 - 4. Top, Bottom, and Edge Cover for Anchorage Devices: **3/4 -inch (19 mm)**.
- J. Maintain minimum clearance of **6 -inches (150 mm)** between tendons and openings.
- K. Prior to concrete placement, mark tendon locations on formwork with spray paint.
- L. Do not install sleeves within **36 -inches (914 mm)** of anchorages after tendon layout has been inspected.
- M. Do not install conduit, pipe, or embeds requiring movement of tendons after tendon layout has been inspected.
- N. Do not use couplers unless location has been approved by Architect.

3.4 SHEATHING INSPECTION AND REPAIR

- A. Inspect sheathing for damage after installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.

1. Ensure that sheathing is watertight and there are no air voids.
 2. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. Maximum length of exposed strand behind anchorages is as follows:
1. Fixed End: 12 -inches (300 mm) .
 2. Intermediate and Stressing End: 1 -inch (25 mm).
 - a. Cover exposed strand with sheathing repair tape to prevent contact with concrete.
- C. Immediately remove and replace tendons that have damaged strand.

3.5 CONCRETE PLACEMENT

- A. Do not place concrete until placement of tendons and nonprestressed-steel reinforcement has been inspected by special inspector .
- B. Provide Architect and special inspector a minimum of 24 hours' notice before concrete placement.
- C. Place concrete as specified in Section 033000 "Cast-in-Place Concrete." Ensure compaction of concrete around anchorages.
- D. Ensure that position of tendon and nonprestressed-steel reinforcement does not change during concrete placement. Reposition tendons and nonprestressed-steel reinforcement moved during concrete placement to original location.
- E. Ensure that method of concrete placement does not damage tendon sheathing. Do not support pump lines, chutes, or other concrete-placing equipment on tendons.

3.6 TENDON STRESSING

- A. Calibrate stressing jacks and gages at start of project and at least every six months thereafter. Keep copies of calibration certificates for each jack-and-gage pair on Project site that are available for inspection. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.
- B. Stress tendons only under supervision of a qualified post-tensioning superintendent.
- C. Do not begin stressing operations until concrete strength has reached 3000 psi (20.7 MPa) as indicated by compression tests of field-cured cylinders.
- D. Complete stressing within 72 hours of concrete placement.
- E. If concrete has not reached required strength, obtain Architect's approval to partially stress tendons and delay final stressing until concrete has reached required strength.
- F. Stage stress according to schedule shown on the Contract Drawings.
- G. If detensioning and restressing of tendon is required, discard wedges used in original stressing and provide new wedges.

UNBONDED POST-TENSIONED CONCRETE

- H. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest **1/8 -inch (3.2 mm)**.
- I. Submit stressing records within one day of completion of stressing. If discrepancies between measured and calculated elongations exceed plus or minus 7 percent, resolve these discrepancies to satisfaction of Architect.
- J. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and calculated and measured elongations agree within 7 percent.
- K. If measured elongations deviate from calculated elongations by more than 7 percent, additional testing, restressing, strengthening, or replacing of affected elements may be required.
- L. Stressing Records: Special Inspector shall record the following information during stressing operations:
 - 1. Name of Project.
 - 2. Date of approved installation drawings used for installation and stressing.
 - 3. Floor number and concrete placement area.
 - 4. Date of stressing operation.
 - 5. Weather conditions including temperature and rainfall.
 - 6. Name and signature of inspector.
 - 7. Name of individual in charge of stressing operation.
 - 8. Serial or identification numbers of jack and gage.
 - 9. Date of jack-and-gage calibration certificates.
 - 10. Gage pressure to achieve required stressing force per supplied calibration chart.
 - 11. Tendon identification mark.
 - 12. Calculated tendon elongation.
 - 13. Actual tendon elongation.
 - 14. Actual gage pressure.

3.7 TENDON FINISHING

- A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by Architect.
- B. Cut strand tails as soon as possible after approval of elongations.
- C. Cut strand tail between **1/2 -inch** and **3/4 -inch (13 and 19 mm)** from wedges. Do not damage tendon or concrete during removal of strand tail. Acceptable methods of cutting strand tail include the following:
 - 1. Oxyacetylene flame.
 - 2. Abrasive wheel.
 - 3. Hydraulic shears.
 - 4. Plasma cutting.
- D. Install caps and sleeves on intermediate anchorages within one day of stressing.

- E. Cut strand tails and install caps on stressing-end anchorages within one day of Architect's acceptance of elongations.
- F. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests .
 - 1. Before concrete placement, special inspector will inspect the following for compliance with post-tensioning installation drawings and the Contract Documents:
 - a. Location and number of tendons.
 - b. Tendon profiles and cover.
 - c. Installation of backup bars, hairpins, and other nonprestressed reinforcement shown on post-tensioning installation drawings.
 - d. Installation of pocket formers and anchorage devices.
 - e. Repair of damaged sheathing.
 - f. Connections between sheathing and anchorage devices.
 - 2. Special inspector will record tendon elongations during stressing.
 - 3. Special inspector will immediately report deviations from the Contract Documents to Architect.
- B. Prepare test and inspection reports.

3.9 PROTECTION

- A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade components.
- B. Protect exposed components within one workday of their exposure during installation.
- C. Prevent water from entering tendons during installation and stressing.
- D. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.10 REPAIRS

- A. Submit repair procedure to Architect for evaluation and approval.
- B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by Architect.

- END OF SECTION -

- SECTION 03 5413 -**GYPSUM CEMENT UNDERLAYMENT**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Gypsum Cement Floor Underlayment.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [ASTM International \(ASTM\)](#) Publications: (Former American Society for Testing and Materials)
 - 1. C472 "Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete".

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:

1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 QUALITY ASSURANCE

- A. Installer's Qualifications: An experienced installer who is acceptable to manufacturer, who has completed cement-based underlayment applications similar in material and extent to that required for this Project, and whose work has resulted in construction with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.
- C. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written recommendations for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.
- B. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.

1.9 COORDINATION

- A. Coordinate cement-based underlayment with requirements of finish flooring products, including adhesives, specified in Division 09 Sections.
 1. Before installing surface sealers recommended by underlayment manufacturer, if any, verify compatibility with finish flooring installation adhesives.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Acceptable Manufacturers:
 - 1. "LevelRock 4500 Floor Underlayment with Levelrock Floor Primer" or "LevelRock 4500 NXG Floor Underlaymet"; [USG \(United States Gypsum Company\)](#) (800-847-4431)
 - 2. "Dura-Cap with Maxxon Overspray Primer/Sealer"; [Maxxon Corporation](#) (800-356-7887)
 - 3. "Firm-Fill 4010 with Hacker TopCoat SP"; [Hacker Industries, Inc.](#) (800-642-3455)

2.3 PRODUCTS AND MATERIALS

- A. Gypsum Cement: Gypsum cement product as manufactured by listed manufacturers.
- B. Aggregate: Well-graded, washed gravel, 1/ -inch to 1/4 -inch, or coarse sand as recommended by underlayment manufacturer.
 - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than 70 degrees F.
- D. Floor Primer and Sealer: Products of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

2.4 MIXES: Mix proportions and methods shall be in strict accordance with product manufacturer's recommendations.

- A. Compressive strength of **2,500 psi**.
 - 1. Do not over water.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for conditions affecting performance of underlayment including substrate moisture content. Begin underlayment application only after unsatisfactory conditions have been corrected.

3.2 RESTORATION

- A. Remove all damaged Gypsum Cement Underlayment in area of work.
- B. Saw cut perimeter of areas indicated for removal to depth of substrate without cutting through existing substrate. Make cuts perpendicular to underlayment surfaces. Remove all loose and deteriorated materials.

- C. If existing substrate is found to be in a deteriorated condition, notify the Owner's Representative in writing of the extent of the damaged areas. Remove damaged substrate materials to centerline of nearest structural member, and replace with matching materials of same thickness as original, as approved by Owner's Representative.

3.3 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions for substrate indicated. Provide clean, dry, neutral-pH substrate for underlayment application.
 - 1. Subfloor shall be structurally sound, clean, and free of mud, oil, grease, or other contaminants.
- B. Prior to installation of Gypsum Cement Underlayment, General Contractor shall inspect the area to be poured for proper attachment of the subfloor and replace any areas of subfloor that have weakened or delaminated during construction. All stud wall base plates in doors and other openings shall be removed.
 - 1. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
 - 2. Treat nonmoving substrate cracks to prevent cracks from telegraphing through underlayment according to manufacturer's written recommendations.
 - 3. Fill substrate voids to prevent underlayment from leaking.
 - 4. Verify that the subfloor deflection meets project specification.
- C. Priming Subfloor:
 - 1. Spray one coat of Floor Primer with a concrete or garden sprayer over entire plywood deck using mix as recommended by underlayment. When applying underlayment over APA span-rated oriented strand or waferboard, apply conditioner and primer as required by underlayment manufacturer.
- D. Expansion Joints: Allow joints to continue through the underlayment at same width.

3.4 APPLICATION OF GYPSUM CEMENT UNDERLAYMENT

- A. Scheduling: Application shall not begin until the building is enclosed, including roof, windows, doors and other fenestration. Install after drywall installation.
- B. Application: Place underlayment at **1 -inch** minimum over subfloor. Spread and screed to a smooth surface. Except at authorized joints, place underlayment as continuously as possible until application is complete so that no gypsum cement slurry is placed against underlayment product that has obtained its initial set.
 - 1. Refer to drawings for conditions indicated to be a different depth.
- C. Curing: General Contractor shall provide continuous ventilation and adequate heat to rapidly remove moisture from the area until the underlayment is dry. Contractor shall provide mechanical ventilation if necessary. This Contractor shall test for dryness in the presence of the Owner's Representative utilizing the procedure as recommended by the underlayment manufacturer.

3.5 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

- A. Sealing: Seal all areas that receive glue according to the underlayment manufacturer's specifications. Any floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used.
 - 1. Where floor goods manufacturers require special adhesive or installation systems, their requirements supersede these recommendations.

3.6 FIELD QUALITY CONTROL

- A. Slump Test: Gypsum cement mix shall be tested for slump as it's being pumped using a 2" x 4" cylinder for compliance with manufacturer's written recommendations.
- B. Field Samples: At least one set of 3 molded cube samples shall be taken from each day's pour during the application. Cubes shall be tested as recommended by the underlayment manufacturer in accordance with [ASTM](#) C472 using split brass molds. Test results shall be available to Owner's Representative and Contractor from applicator upon request.

3.7 PROTECTION

- A. During construction, contractor shall place temporary wood planking over underlayment wherever it will be subjected to heavy wheeled or concentrated loads.

- END OF SECTION -

DIVISION 04 – MASONRY

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- SECTION 04 2000 -**UNIT MASONRY**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Types of masonry work required include:
 - a. Standard Concrete Masonry Units
 - b. Face Brick
 - c. Stone Trim Units
 - d. Special Masonry Shapes
 - e. Mortar and Grout
 - f. Reinforcing Steel
 - g. Masonry Joint Reinforcement
 - h. Required Masonry Ties and Anchors

1.3 RELATED REQUIREMENTS

- A. Section 07 1900 "Water Repellents and Graffiti Resistant Coatings"
- B. Section 07 6200 "Sheet Metal Flashing and Trim"
- C. Section 07 9200 "Joint Sealants"
- D. Section 07 9213 "Exterior Façade Joint Sealants"
- E. Section 09 9123 "Interior Painting"
- F. Section 09 9123.13 "Paint Schedule"
- G. Section 09 9600 "High Performance Coatings"
- H. Products installed, but not furnished, under this Section include the following:
 - 1. Steel Lintels and Shelf Angles for unit masonry, furnished under Section 05 5000 "Metal Fabrications".

2. Hollow-metal frames in unit masonry openings, furnished under Section 08 1113 "Hollow Metal Doors and Frames".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [ASTM International](#) Publications:
 1. A82 "Standard Specification for Steel Wire, Plain, for Concrete Reinforcement"
 2. A185 "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete"
 3. A307 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength"
 4. A496 "Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement"
 5. A497 "Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete"
 6. A615 "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"
 7. A951 "Standard Specification for Masonry Joint Reinforcement"
 8. C90 "Standard Specification for Loadbearing Concrete Masonry Units"
 9. C140 "Test Methods of Sampling and Testing Concrete Masonry Units and Related Units"
 10. C144 "Standard Specification for Aggregate for Masonry Mortar"
 11. C270 "Standard Specification for Mortar for Unit Masonry"
 12. C404 "Standard Specification for Aggregates for Masonry Grout"
 13. C476 "Standard Specification for Grout for Masonry"
 14. C1314 "Standard Test Method for Compressive Strength of Masonry Prisms"
 15. E119 "Standard Test Methods for Fire Tests of Building Construction and Materials"
 16. E514 "Test Method for Water Penetration and Leakage through Masonry"
- C. Joint [American Concrete Institute \(ACI\)](#) / [American Society of Civil Engineers \(ASCE\)](#) / [The Masonry Society \(TMS\)](#) Publications:
 1. [ACI 530-1/ASCE 6/TMS 602](#) "Specification for Masonry Structures"
 2. [ACI 530/ASCE 5/TMS 402](#) "Building Code Requirements for Masonry Structures"
- D. [National Concrete Masonry Association \(NCMA\)](#) Publications:
 1. "Tek" Bulletins

1.5 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths at 28 days. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 1 and 2 in [ACI 530.1/ASCE 6/TMS 602](#).
- B. Determine net-area compressive strength of masonry by testing masonry prisms according to [ASTM C1314](#).

- C. Fire Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies with fire-resistance ratings determined by testing in compliance with [ASTM](#) E119 by a recognized testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.
- B. Samples for Initial Selection: For the following:
 - 1. Unit masonry samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
- C. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.7 QUALITY ASSURANCE

- A. Unit Masonry Standard: Comply with [ACI](#) 530.1/ASCE 6/TMS 602, "Specifications for Masonry Structures", except as otherwise indicated.
 - 1. Revise [ACI](#) 530.1/ASCE 6 to exclude Sections 1.5; Parts 1.6-A.1.b and 1.6-A.1.c; and Part 3.3-E.
- B. Fire Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies with fire-resistance ratings determined by testing in compliance with [ASTM](#) E119 by a recognized testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authority having jurisdiction.
- C. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each different product required for each continuous surface or visually related surfaces.
- D. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- E. Sample Panels: Before installing unit masonry, build sample panels, using materials indicated for the completed Work, to verify selection and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 1. Locate panels in the locations indicated or, if not indicated, as directed by Owner's Representative and/or Architect.
 - 2. Clean exposed faces of panels with masonry cleaner indicated.
 - 3. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - 4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints;

- aesthetic qualities of workmanship; and other material and construction qualities specifically approved by the by Owner's Representative and/or Architect. in writing.
- a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by the by Owner's Representative and/or Architect. in writing.
 5. Demolish and remove sample panels when directed.
 6. Clay Masonry Unit Test: For each clay masonry unit indicated, per [ASTM C67](#).
 7. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per [ASTM C140](#).
 8. Prism Test: For each type of wall construction indicated, per [ASTM C1314](#).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- E. Store masonry accessories, including metal items, to prevent deterioration by corrosion and accumulation of dirt.
- F. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

1.9 PROJECT/SITE CONDITIONS

- A. Protection of Work: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform roof loading for at least 12 hours after building masonry walls or columns.
- C. Do not apply uniform roof or floor loading until the masonry has cured to the extent that it will safely support the intended load, a minimum of 12 hours after building masonry walls or columns.
- D. Do not apply concentrated loads until the masonry has cured to the extent that it will safely support the intended load, a minimum of 3 days after building masonry walls or columns.

UNIT MASONRY

- E. Staining: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by means of coverings spread on ground and over wall surface.
 - 2. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

1.10 WEATHER PROTECTION

- A. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
 - 1. Comply with hot weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 2. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. Superlite Block of Phoenix, an [Oldcastle Architectural Inc. www.superliteblock.com](http://www.superliteblock.com)
 - 2. [Oldcastle Architectural Inc. www.oldcastle.com](http://www.oldcastle.com)
 - 3. Approved Substitution.
- C. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
 - 1. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 - 2. Provide square-edged units for outside corners, unless indicated otherwise on the Drawings.
- D. Concrete Masonry Units: Provide units complying with characteristics indicated below for grade, type, face size, exposed face and, under each form of block included, for weight classification:
 - 1. Size:
 - a. Unless noted otherwise on [Exterior Finish Index](#), provide manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thickness indicated.
 - 2. Exposed Faces:
 - a. Manufacturer's Standard Gray Color and Texture
 - d. Face Finish:

- 1) Smooth
3. Hollow Loadbearing Block: [ASTM](#) C90, and as follows:
 - a. Weight Classification: Medium weight, minimum compressive strength of 2000 psi (net area).
4. Integral Water Repellent: At exterior exposed units, provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to [ASTM](#) E514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen.
 - a. Avendra, LLC Preferred Manufacturers:
 - 1) None
 - b. Approved Manufacturers:
 - 1) "Dry-Block"; [W. R. Grace & Co., Construction Products Div](#) (800-558-7066)
 - 2) "Eucon Blocktite"; [Euclid Chemical Co. An RPM Company](#); (800-321-7628)

2.2 FIRE RATINGS:

- A. Where fire ratings on masonry walls are shown on the Drawings, the Contractor shall make certain that the fire-resistant units to be used qualify for the ratings.

2.3 MORTAR AND GROUT MATERIALS

- A. Colored Cement Product: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. [LeHigh Cement Co.](#) (800-523-5488)
 - b. [Cemex](#) (800-245-1705)
 - c. [Custom Building Products](#) (800-272-8786)
 - d. [LaFarge Corporation](#) (800-336-2490)
 - e. [Essroc, Italcementi Group](#) (800-245-1717)
 3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Use cement with synthetic iron oxide pigment only.
 4. Aggregate for Mortar: [ASTM](#) C144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- B. Aggregate for Grout: [ASTM](#) C404.
- C. Grout for Unit Masonry: Comply with [ASTM](#) C476 for grout for use in construction of reinforced and nonreinforced unit masonry. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Minimum compressive strength shall be 2,500 psi in 28 days.
 1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.

2. Use coarse grout (maximum 3/8" aggregate) in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.

D. Mortar Color: See Exterior Finish Index.

E. Water: Potable

2.4 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

A. General: Comply with [ASTM A 951](#).

B. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:

1. Mill Galvanized Steel Wire: [ASTM](#) A82 for uncoated wire and with [ASTM](#) C641 for zinc coating of class indicated below:
 - a. Class 1 (0.40 oz. per sq. ft. of wire surface).
2. Hot-Dip Galvanized, Carbon Steel Wire: [ASTM](#) A82 with [ASTM](#) A153 for zinc coating of class indicated below:
 - a. Class B-2.

C. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:

1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior.
2. Wire Size for Side and Cross Rods: #9 Gauge
3. For single-wythe masonry, provide type as follows with single pair of side rods:
 - a. Truss design with continuous diagonal cross rods spaced not more than 16" o.c.

D. Flexible Anchors: Where flexible anchors are indicated for connecting masonry to structural framework, provide 2-piece anchors, as described below, which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall.

1. Masonry Veneer Anchors: Two-piece assemblies which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall, consisting of wire tie section and metal anchor section for attachment over sheathing to metal studs and complying with the following requirements:
 - a. Wire Size: 0.1875" Diameter
 - b. Wire Tie Shape: Rectangular with Cavity Drip
 - c. Wire Tie Length: As Required to Extend Within 1-1/2" of Masonry Wythe of Veneer Face
2. Control Joint Anchors: Corrugated galvanized steel, 6-1/4" long x 1" wide x 24 gauge, with 1/4" wide x 1-3/4" deep V-groove.

E. Anchor Section: Sheet metal plate, with screw holes top and bottom and with raised, rib-stiffened strap stamped into center to provide slot between strap and plate for connection of wire tie, of overall size and thickness indicated below:

1. Size: Plate and strap size: 1-1/4" wide for plate, 5/8" for strap x lengths indicated below. Slot clearance formed between face of plate and back of strap at maximum rib projection: 1/32" + diameter of wire tie.
2. Plate and Strap Lengths: 5" and 3-5/8", with both sides of plate stiffened by ribs.
3. Thickness: 0.0747" (14 Gauge)

2.5 REINFORCING STEEL

- A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.
- B. Steel Reinforcing Bars: Material and grade as follows:
- C. Billet steel complying with [ASTM](#) A615, Grade 60.
- D. Deformed Reinforcing Wire: [ASTM](#) A496.
- E. Plain Welded Wire Fabric: [ASTM](#) A185.
- F. Deformed Welded Wire Fabric: [ASTM](#) A497.

2.6 ACCESSORIES

- A. Premolded Control Joint Strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall. Size and configuration as indicated.
 1. Polyvinyl Chloride Complying with [ASTM](#) D2287, General Purpose Grade, Designation PVC-63506.
 - a. Avendra, LLC Preferred Manufacturers:
 - 1) None
 - b. Approved Manufacturers:
 - 1) "AA2000-2001 Blocktite"; [Hohmann & Barnard, Inc.](#) (800-645-0616)
 - 2) "Rapid Poly-Joint"; [Dur-O-Wal, A Dayton Superior Company](#) (800-323-0090)
- B. Bond Breaker Strips: Asphalt-Saturated Organic Roofing Felt Complying with [ASTM](#) D226, Type I (No. 15 Asphalt Felt)
- C. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units shall be formed from [\[0.187-inch\]](#) steel wire, hot-dip galvanized after fabrication.
 1. Provide units with either two loops or four loops as needed for number of bars indicated.
 2. Avendra, LLC Preferred Manufacturers:
 - a. None
 3. Approved Manufacturers:
 - a. "D/A 811"; [Dur-O-Wal, A Dayton Superior Company](#) (800-323-0090)
 - b. "D/A 816"; [Dur-O-Wal, A Dayton Superior Company](#) (800-323-0090)
 - c. "#RB Rebar Positioner"; [Hohmann & Barnard, Inc.](#) (800-645-0616)
 - d. "#RB-Twin Rebar Positioner"; [Hohmann & Barnard, Inc.](#) (800-645-0616)

- D. Anchor Bolts: Provide steel bolts with hex nuts and flat washers complying with [ASTM A307](#), Grade A, hot-dip galvanized to comply with [ASTM C153](#), Class C, in sizes and configuration indicated.

2.7 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard strength general purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned without damaging or discoloring masonry surfaces.
- B. Avendra, LLC Preferred Manufacturers:
1. None
- C. Approved Manufacturers:
1. "Sure Klean No. 600 Detergent"; [ProSoCo, Inc.](#) (800-255-4255)
 2. "202 New Masonry Detergent"; [Diedrich Technologies, Inc.](#) (800-323-3565)

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
- B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
- C. Mortar for Unit Masonry: Comply with [ASTM C270](#), Proportion Specification, for types of mortar required, unless otherwise indicated.
1. Use Type mortar as shown on Drawings.
 - a. Minimum compressive strength as shown on Drawings.
 2. For reinforced masonry and where indicated, use Type - **S**.
- D. Grout for Unit Masonry: Comply with [ASTM C476](#).
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with [ASTM C476](#), Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of **10 to 11 inches** as measured according to [ASTM C143](#).

2.9 SOURCE QUALITY CONTROL

- A. Contractor will engage a qualified independent testing agency to perform source quality-control testing indicated below:
1. Payment for these services will be made by Marriott .

2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to [ASTM](#) C140.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. Verify that foundations are within tolerances specified.
 2. Verify that reinforcing dowels are properly placed.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION - GENERAL

- A. Do not wet concrete masonry units.
- B. Cleaning Reinforcing: Before placing, remove loose rust, and other coatings from reinforcing.
- C. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.
- D. Build chases and recesses to accommodate items specified in this Section or in other sections of the Specifications as shown or required. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- E. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.
- F. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.
 1. Use dry cutting saws to cut concrete masonry units.
- G. Select and arrange units for exposed unit masonry to provide a uniform blend of colors and textures.
- H. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530-1/ASCE 6/TMS 602 and the following:
1. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20'. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more. For vertical alignment of head joints, do not exceed plus or minus 1/4" in 10'.
 2. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls, do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.
 3. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.
 4. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
- C. Bond Pattern: Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back 1/2-unit length for 1/2-running bond or 1/3-unit length for 1/3 running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- E. Built-in Work: As construction progresses, build-in items specified under this and other Sections of these Specifications. Fill in solidly with masonry around built-in items.
1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
 3. Fill cores in hollow concrete masonry units with grout 24" under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.
- F. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

Install compressible filler in joint between top of partition and underside of structure above.

1. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with:
 - a. Section 08 8413 "Penetration Firestopping"
 - b. Section 07 8446 "Fire-Resistant Joint Systems"

3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units and brick units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.
- D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.
- E. All exposed joints shall be well-tooled to a concave or rodded profile, unless otherwise indicated.
 1. Provide raked joints at all vertical scores in scored brick units. Strike to match concave or rodded profile of horizontal joints.
 2. Rake-out expansion joints and joints indicated on Drawings to receive sealant.
- F. Mortar joints shall be struck at a consistent time interval when mortar is at the same medium stiff consistency in order to minimize color variations.
- G. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- H. Collar Joints: After each course is laid, fill the vertical longitudinal joint between wythes solidly and with mortar for the following masonry work:
 1. All exterior walls, except cavity walls, and interior walls and partitions.
- I. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically.
- J. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
- K. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
 1. Provide individual metal ties at not more than 24" o.c. vertically.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls. Lap reinforcing a minimum of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing, unless specifically noted to be omitted.
- D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- E. Space continuous horizontal reinforcement as follows:
 - 1. For single-wythe walls, space reinforcement at 16" o.c. vertically, unless otherwise indicated.
- F. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening, except at control joints.
 - 1. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.7 ANCHORING MASONRY WORK

- A. General: Provide anchor devices of type indicated.
- B. Anchor single wythe masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:
 - 1. Fasten each anchor section through sheathing to metal studs with two metal fasteners of type indicated.
 - 2. Embed tie section in masonry joints. Provide not less than 1" air space between back of masonry veneer wythe and face of sheathing.
 - 3. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
 - 4. Space anchors as indicated, but not more than 16" o.c. vertically and 24" o.c. horizontally. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 3'-0".
- C. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
 - 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

- D. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
1. Fasten anchors to concrete and masonry backup with metal fasteners of type indicated.
 2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in related items as the masonry work progresses.
- B. Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 30'-0" o.c. for concrete masonry wythes if reinforced, or 20'-0" o.c. if not reinforced. Locate control joints at points of natural weakness in the masonry work.
- C. Build-in non-metallic joint fillers where indicated.

3.9 LINTELS

- A. Provide masonry lintels where shown and wherever openings of more than 2'-0" for block size units or more than 1'-0" for brick size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.13 PARGING

- A. Parge inside face of firepit wall.

3.14 REPAIRING, POINTING AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Install new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel. Leave 1/2 panel uncleaned for comparison purposes. Obtain Owner's Representative approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
4. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

3.15 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

- END OF SECTION -

- SECTION 04 2115 -**ADHERED (THIN) BRICK VENEER**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Adhesive adhered, solid, manufactured thin brick veneer for exterior unit application on/over building substrate as follows:
 - 1. Exterior thin brick veneer with liquid applied waterproof membrane applied to cement plaster scratch and brown coat assembly over framed walls.
- B. Waterproofing / Anti-fracture membrane – Liquid applied.
- C. Adhesives (thin set), fasteners and grout.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 01 4339 "Mockup Requirements"
- D. Section 01 4553 "Façade Mockup Testing"
- E. Section 04 7300 "Manufactured Stone Adhered Masonry Veneer".
- F. Section 06 1600 "Sheathing" for exterior wall sheathing as base behind cement plaster.
- G. Section 07 1900 "Water Repellent & Graffiti Resistant Coatings" for water repellent and anti-graffiti coating installed over masonry finish surfaces.
- H. Section 07 9213 "Exterior Facade Joint Sealants".
- I. Section 09 2236 "Metal Lath & Accessories" for metal lath and accessories for scratch and brown coat.

- J. Section 09 2513 "Acrylic Modified Portland Cement Plastering" for plaster as scratch and brown coats substrate.
- K. Section 09 9113 "Exterior Painting" for paint coating installed over masonry finish surfaces
- L. Section 09 3053 "Exterior Tiling" for tile installed over metal lath scratch and brown coat substrate.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- C. ANSI: American National Standard Specifications for Installation of Ceramic Tile. ANSI A108 Series:
- D. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- E. ASTM C 1088 - Standard Specification for Thin Veneer Brick Units Made From Clay or Shale.
- F. Module Size: Actual tile size plus joint width indicated.
- G. Face Size: Actual tile size, excluding spacer lugs.
- H. Large format: Square or rectangular tiles greater than 12 inches nominal on any side.

1.5 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 3300 "Submittal Procedures".
 - 1. Product Data: Submit for all specified products. Include all applicable physical and performance data.
 - 2. Samples: Submit 4 samples of thin brick/panel brick veneer units to illustrate color, texture, and size range of each type unit.
 - 3. Manufacturer's detailed installation instructions.
 - 4. List of projects on which manufacturer has supplied thin brick/panel brick veneer materials.
- B. Shop Drawings: Show locations of each type of thin brick and pattern.
 - 1. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Demonstrate uniform texture and color, or a uniform blend within the ranges accepted by the Architect for these characteristics. Fully exhibit color variations within ranges, blend tile in samples to show full range of colors to be provided.

ADHERED (THIN) BRICK VENEER

2. Assembled Samples with grouted joints for each type of stone thin brick and for each finish required, at least 36 -inches (900 mm) square and mounted on a rigid panel. Use grout of type and in color(s) approved for completed Work.

- E. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.
- F. Test and Inspection Reports for Field Quality-Control Testing of Structural-Sealant Adhesion:

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Maintenance Data: For dimension stone tile to include in maintenance manuals.

1.7 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700 "Closeout Procedures".
- B. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Thin brick: Obtain thin brick from one source or producer.
 1. Obtain thin brick of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials:
 1. Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 1. Liquid applied Waterproof membrane.
 2. Thin set mortars
 3. Grouts
- D. Preinstallation Conference: Conduct conference at Project site.
 1. Review requirements in ANSI including A108.01 for substrates and for preparation by other trades.
 2. Attendees should include, but not limited to;
 - a. General Contractor
 - b. Architect
 - c. Owner's representative
 - d. Setting material representative
 - e. Tile installation contractor

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products of this section on pallets, with individual faces protected; keep dry.
 - 1. Protect materials from rain, moisture, and freezing temperatures.
- B. Store manufactured thin brick/panel brick veneer above ground on level platforms, which allow air circulation under stacked units. Do not double-stack pallets.
- C. Store mortar materials on pallets in dry place.
- D. Store liquid materials in unopened containers and protected from freezing.

1.10 MOCK-UP

- A. Vertical application Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution. Use thin brick selected by verification samples.
 - 1. Within 120 days of mobilization, provide minimum 4 -feet by 12 -feet by 8 -feet tall onsite mock up, including field area, outside corner, full window opening (with window, head and jamb trim and sill), and representative examples of other design conditions for review and approval by Architect prior to commencing actual work.
 - a. Include a sealant-filled joint at least 48 -inches (1600 mm) long in mockup.
 - b. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of mockup approximately 16 -inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit finish above half of flashing).
 - c. Include metal studs, sheathing, flashing in exterior wall mockup.
 - d. Combine mock-up with that specified for exterior plaster in related section. Show relationships and transitions between materials.
 - 2. Protect accepted mockups from the elements with weather-resistant membrane.
 - 3. Approval of mockups is for color, texture, and blending of tile; relationship of mortar and sealant colors to tile colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities Architect specifically approves in writing , including required tests of installed windows, as described in related Sections specifying Windows and Curtain Wall.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - c. Mock-up will also be used for testing of assembly.
 - 4. Mock up or portions of mock up may require more than one iteration and shall be erected in a long term location near the building. Mock-up may not be incorporated into the Work.
 - 5. Approved mockup will form the standard for comparison for Architect's judging aesthetic qualities of the finished work.

1.11 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Minimum air temperature of 40 degrees F (4 degrees C) prior to, during, and for 48 hours after completion of work unless approved otherwise by setting material manufacturer.
 - 2. Cold Weather Requirements: IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.
- B. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

1.12 SEQUENCING AND SCHEDULING

- A. Sequence thin brick installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Install thin brick and accessories only after other finishing operations, including painting, have been completed.
- C. Install thin brick and accessories only after other finishing operations, including painting, have been completed.

1.13 EXTRA MATERIALS

- A. Comply with provisions of Section 01 7700 "Project Closeout".
- B. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Thin brick and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 5 percent of amount installed for each type, composition, and color indicated.
 - 3. This extra stock shall be in addition to unused product remaining at completion of work, which shall be left for Owner's use, and in addition to product used in construction of mockups.

1.14 WARRANTY

- A. Comply with provisions of Section 01 7700 "Project Closeout".
- B. Assemblies: Exterior
 - 1. Provide single source warranty by setting, grout and liquid applied waterproof / Anti-fracture membrane manufacturer for not less than the following:
 - a. Metal framed walls: Fifteen (15) years.
 - b. Concrete substrate (CMU, Tilt-up or CIP): Twenty-five (25) years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MATERIALS, GENERAL

- A. ANSI Standards for thin brick Installation Materials: Provide materials complying with ANSI standards herein referenced in Part 1 and other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in thin brick installation schedules, and other requirements specified.
- B. Factory Blending: For thin brick, blend thin brick in factory and package so thin brick units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 MANUFACTURERS – THIN BRICK

- A. Manufacturers: Subject to compliance with requirements, provide products as specified and indicated on Drawings.:
- B. Basis-of-Design: The design is based on products as herein listed and/or shown on the drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufacturers:
 - 1. Endicot, www.endicott.com
 - 2. Glen Gery Brick Company, www.glengerybrick.com
 - 3. General Shale, www.generalshale.com
- C. Alternate Manufacturers: Alternate products must be approved by Architect.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. See Section 01 2500.
- D. Provide all thin brick from a single manufacturer.

2.4 MATERIALS – THIN BRICK (S-1)

- A. Thin Brick: ASTM C 1088, Type TBS, tested in accordance with ASTM C 67.
 - 1. General:
 - a. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 10,000 psi (68.95 MPa).
 - b. Initial Rate of Absorption: Less than 12 g/12 sq. in. (12 g/77 sq. cm) per minute when tested per ASTM C 67.
 - c. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

- d. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 -feet (3 m).

B. Schedule:

- 1. Designation: Refer to Drawings
 - a. Mfgr: Refer to Drawings
 - b. Style/Series: Refer to Drawings
 - c. Blend: Refer to Drawings
 - d. Size:
 - 1) Height: Refer to Drawings
 - 2) Length: Refer to Drawings
 - 3) Thickness: 1/2 -inch

C. Colors: As herein indicated , unglazed or similar as selected by the Architect from the manufacturer's standard colors.

- 1. Blended pattern of colors as indicated on the Drawings.

D. Trim Units: Matching thin brick color and texture and sizes as indicated on Drawings.

- 1. Corner
- 2. Edge Cap
- 3. End caps, left and right
- 4. Sill.

E. Special shapes: Corner units, sills, headers

- 1. Refer to Drawings.

2.5 MATERIAL , SUBSTRATE – SCRATCH AND BROWN COATS

A. Refer to Sections:

- 1. 09 2236 "Metal Lath and Accessories.
- 2. 09 2513 Acrylic Modified Portland Cement Plastering" for scratch and brown coat.

2.6 MANUFACTURERS – INSTALLATION MATERIALS

A. Basis-of-Design: The design is based on 'single source' products by **Laticrete International**, www.laticrete.com as specified .

- 1. Alternate Manufacturers: Subject to compliance with requirements including "System Warranty", manufacturers offering 'single source' products that may be incorporated into the Work are:
 - a. Custom Building Products, www.custombuildingproducts.com
 - b. MAPEI Corporation, www.mapei.com

B. Source Limitations for Setting Materials, Waterproof / Anti-fracture liquid applied membrane, Grouts and Sealant:

- 1. Obtain ingredients of uniform quality for each component from single manufacturer.

2.7 WATERPROOF / ANTI-FRACTURE MEMBRANE – LIQUID APPLIED (WET AREAS)

- A. General:
 - 1. For thin brick applications.
 - 2. Manufacturer's standard product that complies with ANSI A118.10.
- B. Schedule:
 - 1. Product: (Basis of Design)
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **Hydroban®**
 - c. Data Sheet: 663.0 and 663.5
 - d. System warranty: 15 & 25 years as specified

2.8 SETTING MATERIALS

- A. Thin and Medium-Bed, Polymer fortified and Kevlar reinforced Latex-Portland Cement Mortar which complies with requirements in ANSI A118.4, ANSI A118.11 and ASTM C627.
 - 1. General: Provide product that is approved by manufacturer for application thickness up to **3/4 -inch (19 mm)**.
 - 2. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **255 Multimax**
 - c. Data sheet: 255.0
 - d. System warranty: 25 years (DS 025.0APD)
 - e. VOC: 0 g/L
 - f. Color: For light colored thin brick, use White.

2.9 GROUT MATERIALS

- A. Exterior: Fortified cement-based Grout: ANSI A118.7.
 - 1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **Permacolor®**
 - c. Standard: ISO classification CG2WA
 - d. Data sheet: 250.0
 - e. System warranty: 25 years (DS 025.0APD)
- B. General:
 - 1. Grout Admixture: Type as recommended by the manufacturer.
 - 2. Grout Release: Type recommended by the thin brick manufacturer.
 - 3. Grout Color: As selected by Architect.
 - 4. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 deg F (60 deg C)** and **212 deg F (100 deg C)**, respectively, and certified by manufacturer for intended use.

2.10 ELASTOMERIC SEALANTS

- A. Exterior:
1. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of;
 2. Product: Manufacturer's standard chemically curing, single-component, nonsag, neutral 1-Part elastomeric 100 percent silicone sealants of base polymer and characteristics that comply with applicable requirements including, but not limited to non-staining:
 - a. Section 07 9213 "Exterior Façade Joint Sealants" and do not stain thin brick.
 - 1) Primer as recommended by sealant manufacturer.
 3. Colors: Provide custom colors of exposed sealants to match colors of grout in thin brick adjoining sealed joints as selected by Architect.

2.11 MISCELLANEOUS MATERIALS

- A. Weather Barriers, Building Paper and Flexible Flashing for substrate assembly:
1. As specified in Section 07 2500 "Air and Weather Barriers".
- B. Water Repellent Coating:
1. Applied over adhered and grouted assembly - Exterior
 - a. Type specified in Section 07 1900 "Water Repellent and Graffiti Resistant Coatings".
- C. Concrete substrate:
1. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of thin brick-setting materials for installations indicated.
- D. Cleaner: A neutral cleaner capable of removing soil and residue without harming thin brick and grout surfaces, specifically approved for materials and installations indicated by thin brick and grout manufacturers.
- E. Grout Sealer: (Non epoxy grouts)
1. Exterior: Refer to Water Repellent and Graffiti Resistant Coatings specification.

2.12 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.13 FABRICATION

- A. General: Fabricate units in sizes and shapes required to comply with requirements indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions and substrates are acceptable and are ready to receive work in accordance with the manufacturers written installation instructions
 - 1. Do not start work in an area until adverse conditions in that area are corrected.
- B. Consult Architect if deficiencies exist. Correct deficiencies in accordance with requirements of thin brick veneer manufacturer's written installation instructions.
- C. Examine substrates, areas, and conditions where thin brick will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed thin brick.
- D. Verify that substrates for setting thin brick are firm, dry, clean, free of coatings that are incompatible with thin brick-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 1. Cement Plaster and Concrete Substrate:
 - a. TCNA installation standards require a substrate to meet a maximum variation of **1/4 -inch (6.35 mm)** in **10 -feet (3048 mm)** for both vertical and horizontal thin-bed thin brick installation.
 - 2. Substrate flatness shall not exceed **1/16 -inch (1.58 mm)** deviation in the substrate at the longest dimension of the thin brick.
 - 3. For large format thin brick the substrate cannot exceed **1/16 -inch (1.58 mm)** of irregularity in flatness in **24 -inch (609.6 mm)**. A substrate that exceeds these standards must be filled with an appropriate self-leveling underlayment or ground to the correct tolerance, not filled with additional mortar.
- E. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind thin brick has been completed.
- F. Verify that joints and cracks in thin brick substrates are coordinated with thin brick joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SUBSTRATE TOLERANCE

- A. Flatness: Do not exceed **1/8 -inch +/-** variation in **10 -feet**, non-cumulative.

3.3 PREPARATION

- A. Advise installers of other work about specific requirements relating to placement of inserts, flashing reglets, metal anchors, and similar items to be used by stonework installer for anchoring, supporting, and flashing of dimension stonework.
 - 1. Furnish installers of other work with Drawings or templates showing locations of these items.

- B. Verify items provided by other sections of work are properly sized and located.
- C. Protect surrounding area from possible damage during installation work.
- D. Blending: For thin brick exhibiting color variations, verify that thin brick has been factory blended and packaged so units taken from one package show same range of colors as those taken from other packages and match approved Samples.
 - 1. If not factory blended, blend thin bricks at Project site before installing which would include a minimum of three full pallets of product at a time.
- E. For concrete substrates for thin brick installed with adhesives or thin-set mortar, correct conditions that do not comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
 - a. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- F. Prior to setting, clean adhered thin brick unit surfaces that have become dirty or stained to remove soil, stains, and foreign materials.
 - 1. Clean units by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water.
 - 2. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives and recommended for this use by manufacturer.
- G. Initiating installation constitutes Installer's acceptance of substrates

3.4 WATERPROOFING / ANTI-FRACTURE MEMBRANE INSTALLATION

- A. Install waterproofing to comply with specified manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Install liquid applied waterproofing to comply with ANSI A108.13, ANSI A108.17 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- C. Do not install thin brick or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 INSTALLATION, GENERAL

- A. Thin Brick:
 - 1. Description:
 - a. Exterior:
 - 1) Cover the wall substrate which was previously coated with liquid applied waterproof / anti-fracture membrane with adhesive to a depth in accordance with the manufacturers written installation instructions.
 - 2. Place individual units in position level, with 3/8 -inch joint spacing, plumb with surrounding units.

- a. Apply firm pressure to bed the unit solidly in the adhesive base.
 3. Bond Pattern: Running bond, or as indicated on the Drawings.
 - a. Pattern, bond and coursing shall match of masonry veneer specified in related section.
 4. Use preformed corner units at all corners.
 - a. Install outside corner return units with short and long lengths alternated.
 5. Lay out coursing so that full units occur at ends, locate cut units (if required) to adjust coursing near center of course in inconspicuous location.
 - a. Maintain uniform joint widths.
 6. Plan work to minimize jobsite cutting. Perform necessary cutting with proper tools to provide uniform edges; take care to prevent breaking unit corners or edges.
 - a. Cut units where required for fitting or for installation of built-in items, using power tools; do not install units having chipped or cracked edges on sight-exposed surfaces.
 7. Align base courses to follow accurate floor lines.
 8. Align faces plumb, level, and true, with uniform joint widths.
 9. Size and portion units for best appearance, with joints arranged neat and symmetrical, free of imperfections detracting from overall appearance.
- B. Accurately form intersections and returns. Perform cutting and drilling of thin brick without marring visible surfaces.
1. Carefully grind cut edges of thin brick abutting trim, finish, or built-in items for straight aligned joints.
 2. Fit thin brick closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap thin brick.
- C. Jointing: Joints shall match dimension and style as specified, indicated on Drawings, otherwise as directed by Architect.
1. Widths: **3/8 -inch (0.9 cm)**
 - a. Unless otherwise indicated on Drawings.
 2. Allow adhesive to set and cure in accordance with the manufacturers instructions for individual thin brick veneer units.
 3. Install grout to thin brick veneer joints using a tuck pointing tool, metal tipped mortar bag or a grout setting machine in accordance with the manufacturers written installation instructions.
 4. Fill joints completely with grout.
 5. Remove excess grout; do not allow grout to dry on face of units.
 6. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
 7. Clean and finish joints in accordance with manufacturer's instructions.
- D. Jointing Pattern:
1. Lay thin brick in running bond pattern and other patterns as indicated on the drawings.
 2. Lay out thin brick work and center thin brick fields in both directions in each space or on each wall area.
 3. Lay out thin brick work to minimize the use of pieces that are less than half of a thin brick.
 4. Provide uniform joint widths unless otherwise indicated.

5. For thin brick mounted in sheets, make joints between thin brick sheets same width as joints within thin brick sheets so joints between sheets are not apparent in finished work.
 6. Where adjoining thin brick on walls and soffits are specified or indicated to be same size, align joints.
 7. Where thin bricks are specified or indicated to be whole integer multiples of adjoining thin brick on floor, base, walls, or trim, align joints unless otherwise indicated.
- E. Control Joints: Size in accordance with the following for sealant performance, but in no case larger than adjacent mortar joints in exposed thin brick veneer units.
1. Exterior: Section 07 9213 "Exterior Façade Sealants"
- F. Extend thin brick work into recesses to form complete covering without interruptions unless otherwise indicated.
1. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- G. Lay out thin brick wainscots to dimensions indicated or to next full thin brick beyond dimensions indicated.
- H. Mix thin brick to achieve a uniformly random distribution of color shadings and patterns.
- I. Pattern Orientation: For thin brick varieties with directional pattern, orient pattern as indicated on drawings. If no pattern is shown, request direction from Architect.
- J. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and thin brick.
1. Do not saw-cut joints after installing thin bricks.
 2. Where joints occur in concrete substrates, locate joints in thin brick surfaces directly above them.
 3. Prepare joints and apply elastomeric sealants to comply with requirements in Division 7 Section "Joint Sealants."
- K. Built-in Work: As work progresses, build in door and window frames, nailing strips, anchor bolts, plates, and other items specified in various sections.
1. Build in items plumb and level.
 2. Do not build in organic materials subject to deterioration.

3.6 THIN BRICK INSTALLATION SCHEDULE

- A. Exterior Wall Installation:
1. Installation TCNA W201: Thin-set fortified mortar over Waterproof / Anti-fracture membrane over previously installed cement plaster scratch and brown coat over sheathing and over framing.
 - a. Cement plaster scratch & brown substrate: As specified
 - b. Liquid applied Waterproof / Anti-Fracture membrane over substrate: Per manufacturers written recommendations
 - c. Thin-Set adhesive Mortar: Per manufacturers written recommendations.
 - d. Grout: Per manufacturers written recommendations.

- e. Expansion Joints: TCNA EJ171E
- f. Sealer:
 - 1) Refer to Section 07 1900

3.7 FIELD QUALITY CONTROL

- A. Architect will observe appearance of installed units; installed masonry surfaces shall be free of imperfections which detract from overall appearance when viewed from a distance of 5 -feet (1.5 m) at 90 degrees normal to surface.
- B. Refer to Section 01 4553 "Façade Mockup Testing"
- C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- D. Test Area: Perform tests on mockups and one bay at least 30 -feet (9.1 m), by one story.
- E. Provide water intrusion mockup testing of portion of thin brick assembly in conjunction with exterior window wall / curtain wall testing.
 - 1. Refer to Section 01 4553 "Façade Mockup Testing"
- F. Perform the following test on mockups and representative areas.
 - 1. Shear Tests: Perform modified version of ASTM C482 substituting the pure Portland cement paste bond coat with the specified thin-set mortar as described in Tile Exterior Shear Bond Strength Testing Report , CTIOA Technical Bulletin No. 2010-3-23.
 - 2. Test a minimum of six areas on each building facade.
 - 3. Repair installation areas damaged by testing.
- G. The test is destructive. Repair damage caused by testing and failed areas to match adjacent undisturbed work.
- H. Defective Work:
 - 1. Thin brick will be considered defective if assemblies do not pass tests and inspections.
 - 2. Thin brick will be considered defective if, in the opinion of the Architect, assemblies' exhibit poorly blended thin brick or unacceptable ranges of colors or textures beyond those demonstrated in Verification Samples and Approved Mock-ups.
 - 3. Replace defective work as directed, at no additional costs.
- I. Prepare test and inspection reports.
- J. Wall framing not to exceed 16 -inches o.c. unless direct otherwise in Drawings to be more restrictive.

3.8 ADJUSTING

- A. Cutting and Fitting: Cut and fit for chases, pipes, conduit, sleeves, and grounds.
 - 1. Cooperate with other sections of work to provide correct size, shape, and location.

3.9 GROUTING

- A. Joints shall be packed full and free of all voids or pits, joints shall not be raked. Excess grout shall be cleaned from the surface with water as work progresses. Cleaning shall be done while mortar is fresh and before it hardens on the surface.
- B. Epoxy type:
 - 1. Grout shall be installed in accordance with ANSI A108.3 and A108.6 for epoxy and the manufacturer's recommended procedures and precautions during application and cleaning.
- C. Epoxy Emulsion type:
 - 1. Grout shall be installed in accordance with ANSI A108.6 and A118.3 for epoxy emulsion type and the manufacturer's recommended procedures and precautions during application and cleaning.

3.10 REPAIR

- A. Remove and replace broken, chipped, stained, or otherwise damaged thin brick, defective joints, and dimension thin brick that does not match approved samples and mockups or repair thin brick veneer work including the following description:
 - 1. Defective joints.
 - 2. Stone cladding and joints not matching approved samples and field-constructed mock-up.
 - 3. Work not complying with other requirements indicated.

3.11 CLEANING AND PROTECTING

- A. Comply with Section 01 7400 "Cleaning and Construction Waste Management".
- B. On completion of placement and grouting, clean all thin brick surfaces so they are free of foreign matter.
 - 1. Clean grout smears and haze from thin brick according to thin brick and grout manufacturer's written instructions.
 - a. Use only cleaners recommended by thin brick and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of thin brick and other surfaces to be cleaned.
 - 2. Protect adjacent surfaces and fixtures from effects of cleaning.
 - 3. Flush surfaces with clean water before and after cleaning.
 - 4. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to thin brick and grout manufacturer.
 - 5. Trap and remove coating to prevent drain clogging.
- C. Protect installed thin brick work with heavy covering during construction period to prevent staining, damage, and wear.
 - 1. If recommended by thin brick manufacturer, apply coat of neutral protective cleaner to completed thin brick walls.
- D. Use only nonmetallic tools in cleaning operations.

1. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods which could cause damage, discoloration, etching of surfaces or joints.
- E. Unused products: Uncut thin brick and unopened containers of grout shall be left for the Owner's use.
- F. In-Progress Cleaning: Clean thin brick as work progresses.
 1. Remove mortar fins and smears before tooling joints.
 2. Remove excess sealant and smears as sealant is installed.
- G. Final Cleaning:
 1. Clean thin brick no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes.
 2. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage thin brick.

3.12 SEALING

- A. Refer to Section 07 1900 "Water Repellent & Graffiti Resistant Coatings".

3.13 THIN BRICK INSTALLATION SCHEDULE

- A. Exterior Wall Installation:
 1. Installation **TCNA W244E** similar: Thin-set fortified mortar over Waterproof / Anti-fracture membrane over previously installed cement plaster scratch and brown coat (not cement backer board) over sheathing and over framing.
 - a. Cement plaster scratch & brown substrate: As specified
 - b. Liquid applied Waterproof / Anti-Fracture membrane over substrate: Per manufacturers written recommendations
 - c. Thin-Set adhesive Mortar: Per manufacturers written recommendations.
 - d. Grout: Per manufacturers written recommendations.
 - e. Expansion Joints: TCNA EJ171E
 - f. Sealer:
 - 1) Refer to Section 07 1900

- END OF SECTION -

- SECTION 04 4200 -**EXTERIOR STONE CLADDING (ADHERED)**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes fully adhered exterior Stone Cladding for;
 - 1. Dimension stone panels and trim adhered to substrate.
 - 2. Exterior wall Wainscot.
- B. This Section includes accessories including, but not limited to;
 - 1. Liquid applied Waterproof / Anti-fracture membrane.
 - 2. Setting Materials
 - 3. Grout.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- E. Section 01 4339 "Mockup Requirements"
- F. Section 01 4553 "Façade Mockup Testing"
- G. Section 04 2115 "Adhered (Thin) Brick Veneer" for adjacent wall finish.
- H. Section 06 1600 "Sheathing" for exterior wall sheathing as base behind cement plaster scratch and brown coats.
- I. Section 07 1900 "Water Repellent & Graffiti Resistant Coatings" for water repellent and anti-graffiti coating installed over stone finish surfaces.

- J. Section 07 2419 "Exterior Insulation and Finish System (EIFS)"
- K. Section 07 9213 "Exterior Façade Joint Sealants" for sealing joints between dissimilar materials of stone, at expansion, contraction, control, and isolation joints in related exterior façade surfaces.
- L. Section 08 4113 "Aluminum Framed Entrances and Storefronts"
- M. Section 08 4229 "Automatic Entrances"
- N. Section 08 4413 "Glazed Aluminum Curtain Walls"
- O. Section 09 2236 "Metal Lath & Accessories" for metal lath and accessories for scratch and brown coat.
- P. Section 09 2513 "Acrylic Modified Cement Plastering" for portland cement scratch and brown coat and metal lath on exterior wall surfaces as substrate.
- Q. Section 09 3013 "Tiling" for building interior tiling.
- R. Section 09 3053 "Exterior Tiling"
- S. Section 09 3073 "Ceramic Tiling (Swimming Pools)"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)
 - 1. C144 "Standard Specification for Aggregate for Masonry Mortar"
 - 2. C144 "Standard Specification for Aggregate for Masonry Mortar"
 - 3. C207 "Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (Re-approved 1997)"
 - 4. C482 "Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste".
- C. ACI 530 / ASCE 5 / TMS 402, 2011 "Building Code Requirements and Specification for Masonry Structures and Related Commentaries".

1.5 ALLOWANCES

- A. Quality-control testing is part of testing and inspecting allowance.

1.6 DEFINITIONS

- A. Definitions contained in ASTM C 119 apply to this Section.
- B. Dimension Stone Cladding Assembly: An exterior wall covering system consisting of dimension stone panels and trim together with thin to medium set adhesives mortar and sealants used to secure the stone to the building substrate and to produce a weather-resistant covering.
- C. IBC: International Building Code.
 - 1. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- D. ANSI: American National Standard Specifications for Installation of Ceramic Tile. ANSI A108 Series:
- E. Module Size: Actual stone size plus joint width indicated.
- F. Face Size: Actual stone size, excluding spacer lugs.
- G. Large format: Square or rectangular stone greater than 12 inches nominal on any side.

1.7 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 3300 "Submittal Procedures".
 - 1. Product Data: Submit for all specified products.
 - a. Include all applicable physical and performance data.
 - 2. Samples: Submit 4 samples of thin brick/panel brick veneer units to illustrate color, texture, and size range of each type unit.
 - 3. Manufacturer's detailed installation instructions.
 - 4. List of projects on which manufacturer has supplied thin brick/panel brick veneer materials.
- B. Shop Drawings: Show fabrication and installation details for dimension stone cladding assembly, including dimensions and profiles of stone units.
 - 1. Show locations and details of joints both within dimension stone cladding assembly and between dimension stone cladding assembly and other construction.
 - 2. Include details of grout joints and sealant joints.
 - 3. Show direction of veining, grain, or other directional pattern.
 - 4. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.
- C. Samples for Initial Selection: For joint materials involving color selection.
- D. Samples for Verification:
 - 1. Demonstrate uniform texture and color, or a uniform blend within the ranges accepted by the Architect for these characteristics.
 - a. Fully exhibit color variations within ranges, blend stone in samples to show full range of colors to be provided.
 - 2. Assembled Samples with grouted joints for each type of stone cladding and for each finish required, at least 36 -inches (900 mm) square and mounted on a rigid panel.

- a. Use grout of type and in color(s) approved for completed Work.
- E. Colored Pointing Mortar Samples for Verification: For each color required. Make Samples using same sand and mortar ingredients to be used on Project.
- F. Sealant Samples for Verification: For each type and color of joint sealant required.
- G. Delegated-Design Submittal: For dimension stone cladding assembly.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer..
- B. Material Test Reports:
 - 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards.
 - a. Base reports on testing done within previous three (3) years.
 - 2. For metal components, by a qualified testing agency, indicating chemical and physical properties of metal.
 - 3. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in Section 07 9213 "Exterior Façade Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.
- C. Preconstruction test reports.
- D. Source quality-control reports.
- E. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.9 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700 "Closeout Procedures".
- B. Warranty: Submit specified warranty.

1.10 EXTRA MATERIALS

- A. Comply with provisions of Section 01 7700 "Project Closeout".
- B. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Stone cladding and Trim Units: Furnish quantity of full-size units equal to **5 percent** of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to **5 percent** of amount installed for each type, composition, and color indicated.

3. This extra stock shall be in addition to unused product remaining at completion of work, which shall be left for Owner's use, and in addition to product used in construction of mockups.

1.11 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate dimension stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: A firm or individual experienced in installing dimension stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 1. Liquid applied Waterproof membrane.
 2. Thin set mortars
 3. Grouts
 4. Sealants
- D. Preinstallation Conference: Conduct conference at Project site.
 1. Review requirements in ANSI including A108.01 for substrates and for preparation by other trades.
 2. Attendees should include, but not limited to;
 - a. General Contractor
 - b. Architect
 - c. Owner's representative
 - d. Setting material representative
 - e. Stone installation contractor
- E. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.12 SAMPLE PANELS / MOCKUP

- A. Build sample panels and mockup to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups of typical exterior wall area not less than 72 -inches (1800 mm) long by 48 -inches (1200 mm) high by full thickness.
 - a. Include typical components, attachments to building structure, and methods of installation.
 - b. Include window opening with stone returns and trim.
 - c. Include sealant-filled joint complying with requirements in Section 07 9213 "Exterior Façade Joint Sealants."
 - d. Clean exposed faces of panels with masonry cleaner indicated.
 - e. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

2. Approval of sample panels / mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by the Owner's Representative in writing.
 - a. Approval of sample panels / mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
4. Demolish and remove sample panels when directed.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.
- C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.
- D. Store cementitious and thin set mortar materials on elevated platforms, under cover, and in a dry location.
 1. Do not use cementitious and thin set mortar materials that have become damp.
- E. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

1.14 FIELD CONDITIONS

- A. Protect dimension stone cladding during erection by doing the following:
 1. Cover tops of dimension stone cladding installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 -inches (600 mm) down both sides and hold securely in place.
 2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.
 3. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
 4. Protect sills, ledges, and projections from mortar and sealant droppings.

- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost.
 - 1. Remove and replace dimension stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.
- C. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.
- D. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F (5 deg C) or when joint substrates are wet.
- E. Environmental Limitations: Do not install stone cladding until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
- F. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

1.15 COORDINATION

- A. Coordinate installation of flashing reglets, and similar items to be used by dimension stone cladding Installer for adhering stone, and flashing of dimension stone cladding assembly.
 - 1. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.
- B. Time delivery and installation of dimension stone cladding to avoid extended on-site storage and to coordinate with work adjacent to dimension stone cladding.

1.16 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install stone cladding until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
- B. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

1.17 SEQUENCING AND SCHEDULING

- A. Sequence stone cladding installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Install stone cladding and accessories only after other finishing operations, including painting, have been completed.
- C. Install stone cladding and accessories only after other finishing operations, including painting, have been completed.

1.18 WARRANTY

- A. Comply with provisions of Section 01 7700 "Project Closeout".
- B. Assemblies:
 - 1. Provide single source warranty by setting, grout and liquid applied waterproof / Anti-fracture membrane manufacturer for not less then the following:
 - a. Metal framed walls: (15) fifteen years.
 - b. Concrete substrate (CMU, Tilt-up or CIP): (25) twenty-five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Fabricate and install adhered stone veneer to withstand loads from wind, gravity, movement of building structure, and thermally induced movement, as well as to resist deterioration under conditions of normal use including exposure to weather, without failure.
- B. Provide hand-set (field-installed) adhesive veneer assembly capable of sustaining forces generated by gravity loads, wind loads, and stresses induced by thermal movement, acting separately or in combination, within the indicated parameters.
- C. Shear bond strength between the backing and the stone shall be a minimum of 50 psi in accordance with Building Code and as specified.
- D. Regulatory Requirements: Adhered masonry veneer shall comply with the applicable requirements in "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments Section 1405.9 and Sections 6.1 and 6.3 of ACI 530 / ASCE 5 / TMS 402.
 - 1. Phoenix Building Construction Code
 - a. Section 1405.9.2,
 - 1) 1. Exterior adhered veneer shall not be applied to over head horizontal or overhead sloping surfaces.
 - 2) 2. Exterior adhered veneer shall not be located more than 30 -feet (9144 mm) above any adjacent grade, roof, walkway or similar surface.
 - 3) 3. Special inspection in accordance with Section 1704 shall be provided for installation of all exterior adhered veneer located more than 8 -feet (2438 mm) above and adjacent grade, roof, walkway or similar surface.
 - 2. ACI 530 / ASCE 5 / TMS 402:
 - a. Section 6.3.2.1 Unit sizes - Adhered veneer units shall not exceed 2 5/8 -inch (66.7 mm) in specified thickness, 36 -inch (914 mm) in any face dimension, nor more than 5 square -feet (0.46 meter squared) in total face area, and shall not weigh more than 15 pounds per square foot (718 Pa).
 - b. Section 6.3.2.2 Wall Area Limitations - The height, length, and area of adhered veneer shall not be limited except as required to control restrained differential movement stresses between veneer and backing.
 - c. Section 6.3.2.3 Backing - Backing shall provide a continuous, moisture resistant surface to receive the adhered veneer. Backing is permitted to be masonry,

EXTERIOR STONE CLADDING (ADHERED)

concrete, or metal lath and portland cement plaster applied to masonry, concrete, steel framing or wood framing.

- d. Section 6.3.2.4 Adhesion developed between adhered veneer units and backing shall have a shear strength of at least **50 psi (345 kPa)** based on gross unit surface area when tested in accordance with ASTM C482.
- E. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design dimension stone cladding assembly.
- F. Structural Performance: Dimension stone cladding assembly shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Wind Loads: As indicated.
 2. Equipment Loads: Allow for loads due to window cleaning and maintenance equipment.
- G. Seismic Performance: Dimension stone cladding assembly shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .
 1. Component Importance Factor: 1.0 unless indicated more restrictive on Drawings
- H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: **120 deg F (67 deg C)**, ambient; **180 deg F (100 deg C)**, material surfaces.
- I. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.
- J. Shrinkage and Creep: Allow for progressive vertical shortening of building frame equal to value indicated in structural Drawings in **10 -feet (3 m)**.
- K. Safety Factors for Stone: Design dimension stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:
 1. Safety Factor for Granite: **3** .
 2. Safety Factor for Oolitic Limestone: **8** .
 3. Safety Factor for Dolomitic Limestone: **6** .
 4. Safety Factor for Marble: **5** .
 5. Safety Factor for Quartz-Based Stone: **6** .
 6. Safety Factor for Serpentine: **6** .
 7. Safety Factor for Slate: **5** .
 8. Safety Factor for Travertine: **8** .
 9. Safety Factor for Concentrated Stresses: 4 for granite and 10 for stone varieties other than granite.
- L. Limit deflection in each prefabricated assembly caused by indicated loads and thermal movements, acting singly or in combination with one another, to not more than 1/720 of assembly's clear span or the following, whichever is smaller:
 1. **1/16 -inch (1.5 mm)**, measured in plane of wall.
 2. **1/4 -inch (6 mm)**, measured perpendicular to wall.

- M. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system.
- N. Provision for Deflection of Building Structure:
 - 1. Deflection Due to Weight of Dimension Stone Cladding Assembly: Allow for 1/4-inch (6-mm) vertical deflection in 20-foot (6-m) span of structural members supporting dimension stone cladding assembly.
 - 2. Live Load Deflection: Allow for 1/4-inch (6-mm) vertical deflection in 20-foot (6-m) span of structural members supporting dimension stone cladding assembly, due to live loads imposed on building's structural frame after stone installation.
- O. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials.
 - 1. Materials shall not stain exposed surfaces of stone and joint materials.

2.2 MATERIALS, GENERAL

- A. ANSI Ceramic Stone tile Standard: Provide stone cladding that complies with ANSI A138.1 for installation.
 - 1. Refer also to TCNA "Natural Stone tile Installation Methods" as part of TCNA Manual.
- B. ANSI Standards for Stone tile Installation Materials: Provide materials complying with ANSI standards herein referenced in Part 1 and other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in stone cladding installation schedules, and other requirements specified.
- C. Factory Blending: For stone cladding, blend stone cladding in factory and package so stone cladding units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Stone Products:
 - 1. Varieties and Sources: Subject to compliance with requirements for each stone product type, provide one of the stone varieties indicated.
 - 2. Where threshold types are identical to stone cladding types except for size or finish, provide same variety from same source for each type.
 - 3. Abrasion Resistance: Provide stone with a value of not less than 10, as determined per ASTM C 1353 or ASTM C 241.
 - 4. Provide stone products that are free of defects impairing their function for use indicated, including cracks, seams, and starts.

2.3 MANUFACTURERS - STONE

- A. Manufacturers: Subject to compliance with requirements, provide products as specified and indicated on Drawings.:
- B. Basis of Design
 - 1. Subject to compliance with requirements, provide products as indicated on Drawings.
 - a. Subject to compliance with specified performance requirements and provide the named products.
- C. Alternate Manufacturers: Alternate products must be approved by Architect.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. See Section 01 2500.
- D. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.

2.4 MATERIAL, GRANITE

- A. Material Standard: Comply with ASTM C 615.
- B. Description: (S-2)
 - 1. Refer to Drawings.
- C. Varieties and Sources: Subject to compliance with requirements, provide the following provide one of the following :
 - 1. Refer to Drawings.
- D. Cut: Vein or Fleuri as selected by Architect.
 - 1. Orientation of Veining:
 - a. As indicated on Drawings and if not indicated, then as directed by Architect.
- E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- F. Finish:
 - 1. Match Architect's sample
- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.
- H. Thickness: Not less than 3/4 -inch (20 mm) unless otherwise indicated.

2.5 MATERIAL , SUBSTRATE – SCRATCH AND BROWN COATS (MORTAR BED)

- A. Refer to:
 - 1. Section 09 2236 “Metal Lath and Accessories”.
 - 2. Section 09 2513 “Acrylic Modified Portland Cement Plastering” for scratch and brown coat (ANSI A108.1A).
 - a. Surface finish as required by Waterproof / Anti-fracture membrane manufacturer.

2.6 MANUFACTURERS – INSTALLATION MATERIALS

- A. Basis-of-Design: The design is based on ‘single source’ products by **Laticrete International**, www.laticrete.com as specified .
 - 1. Alternate Manufacturers: Subject to compliance with requirements including “System Warranty”, manufacturers offering ‘single source’ products that may be incorporated into the Work are:
 - a. Custom Building Products, www.custombuildingproducts.com
 - b. MAPEI Corporation, www.mapei.com
- B. Source Limitations for Setting Materials, Waterproof / Anti-fracture liquid applied membrane, Grouts and Sealant:
 - 1. Obtain ingredients of uniform quality for each component from single manufacturer.

2.7 WATERPROOF AND ANTI-FRACTURE MATERIALS

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Waterproofing and Anti-Fracture liquid applied membrane material:
 - 1. Product:
 - a. Mfg: Laticrete International, Inc.
 - b. Product: **Hydroban®**
 - c. Data Sheet: 663.0 and 663.5
 - d. System warranty: 15 & 25 years as specified
 - 2. Horizontal Applications: Roof Deck or Balcony
 - a. Products:
 - 1) Refer to Section 07 1413 “Hot Fluid Applied Rubberized Asphalt Waterproofing”

2.8 SETTING MATERIALS**A. Typical:**

1. Thin and Medium-Bed, Polymer fortified and Kevlar reinforced Latex-Portland Cement Mortar which complies with requirements in ANSI A118.4, ANSI A118.11 and ASTM C627.
 - a. General: Provide product that is approved by manufacturer for application thickness up to **3/4 -inch (19 mm)**.
 - b. Basis of Design:
 - 1) Mfgr: Laticrete International, Inc.
 - 2) Product: **255 Multimax**
 - 3) Data sheet: 255.0
 - 4) System warranty: 25 years (DS 025.0APD)
 - 5) VOC: 0 g/L
 - 6) Color: For light colored stone, use White.

B. Resin backed stone:

1. Two component, high strength epoxy adhesive for spot bonding which complies with requirements of ANSI A118.3.
 - a. General: Provide product that is approved by manufacturer for application thickness up to **3/4 -inch (19 mm)**.
 - b. Mfgr: Laticrete International, Inc.
 - c. Product: **LATAPOXY® 310 Stone Adhesive**
 - d. Additive: Kevlar
 - e. Standard: ISO 13007-1 C2TP1 classification
 - f. Data Sheet: 679.0 and 679.3
 - g. System warranty: 15 & 25 years as specified

2.9 GROUT MATERIALS - JOINTS**A. Fortified cement-based Grout: ANSI A118.7.**

1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **Permacolor®**
 - c. Standard: ISO classification CG2WA
 - d. Data sheet: 250.0
 - e. System warranty: 25 years (DS 025.0APD)

B. General:

1. Grout Admixture: Type as recommended by the manufacturer.
2. Grout Release: Type recommended by the stone cladding manufacturer.
3. Grout Color: As selected by Architect.
4. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 deg F (60 deg C)** and **212 deg F (100 deg C)**, respectively, and certified by manufacturer for intended use.

2.10 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of;
- B. Product: Manufacturer's standard chemically curing, single-component, nonsag, neutral 1-Part elastomeric 100 percent silicone sealants of base polymer and characteristics that comply with applicable requirements in including, but not limited to non-staining:
 - 1. Section 07 9213 "Exterior Façade Joint Sealants" and do not stain stone.
 - a. Primer as recommended by sealant manufacturer.
- C. Colors: Provide custom colors of exposed sealants to match colors of grout in stone adjoining sealed joints as selected by Architect.

2.11 MISCELLANEOUS MATERIALS

- A. Weather Barriers, Building Paper and Flexible Flashing for substrate assembly:
 - 1. As specified in Section 07 2500 "Air and Weather Barriers".
- B. Water Repellent Coating:
 - 1. Applied over adhered and grouted assembly
 - a. Type specified in Section 07 1900 "Water Repellent and Graffiti Resistant Coatings".
- C. Concrete substrate:
 - 1. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of stone-setting materials for installations indicated.
- D. Cleaner: A neutral cleaner capable of removing soil and residue without harming stone and grout surfaces, specifically approved for materials and installations indicated by stone and grout manufacturers.
- E. Grout Sealer: (Non epoxy grouts)
 - 1. Refer to Water Repellent and Graffiti Resistant Coatings specification.

2.12 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.13 FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
 - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
 - 2. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
 - 3. For marble, serpentine, and travertine, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
- B. Facial Dimensions of Stone cladding with Polished or Honed Faces: Do not vary facial dimensions from specified dimensions by more than plus or minus **1/64 -inch (0.4 mm)**.
- C. Facial Dimensions of Stone cladding with Sand-Rubbed Natural-Cleft or Thermal-Finished Faces: Do not vary facial dimensions from specified dimensions by more than plus or minus **1/32 -inch (0.8 mm)**.
- D. Finish exposed faces and edges of stone, except sawed reveals, to comply with requirements indicated for finish and to match approved samples and mockups.
- E. Thickness of Stone cladding with Natural-Cleft or Thermal Finish: Do not vary average thickness of each stone cladding from specified thickness by more than plus or minus **1/16 -inch (1.6 mm)**.
- F. Cut stone to produce uniform joints **3/8 -inch (10 mm)** wide and in locations indicated.
 - 1. Refer to drawings for other joint width which shall govern.
 - 2. Coordinate approval of joint width in Shop Drawings.
- G. Joint Surfaces: Except for specified beveled or eased edges, if any, dress joint surfaces square for full depth of stone cladding.
- H. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- I. Backs of Pieces: Gage units by dressing backs of pieces smooth and flat. When tested with a **24 -inch (600-mm)** straightedge, gap shall not exceed **1/32 -inch (0.8 mm)**.
 - 1. Natural-cleft stone need not be gaged if gap does not exceed **1/16 -inch (1.6 mm)** when tested with a **24 -inch (600-mm)** straightedge on backs of units.
- J. Clean backs of stone to remove rust stains, iron particles, and stone dust.
- K. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
 - 1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.
- L. Carve and cut inscriptions and decorative surfaces.
 - 1. Use skilled stone carvers experienced in the successful performance of work similar to that indicated.

- M. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.
 - 1. Produce moldings and molded edges with machines that use abrasive shaping wheels made to reverse contour of molding shape.
- N. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated.
 - 1. Shape beds to fit supports.
- O. Laser etch inscriptions and decorative surfaces.

2.14 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform source quality-control testing.
 - 1. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
 - 2. Furnish test specimens selected by testing agency from same blocks as actual materials proposed for incorporation into the Work.
 - 3. Flexural Strength Tests: ASTM C 880/C 880M, performed on specimens of same thickness, orientation of cut, and finish as installed stone. One set of test specimens is required to be tested for every 10,000 sq. ft. (1000 sq. m), but not fewer than two sets for each stone variety.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions and substrates are acceptable and are ready to receive work in accordance with the manufacturers written installation instructions
 - 1. Do not start work in an area until adverse conditions in that area are corrected.
- B. Consult Architect if deficiencies exist. Correct deficiencies in accordance with requirements of thin brick veneer manufacturer's written installation instructions.
- C. Examine substrates, areas, and conditions where stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed stone cladding.
- D. Verify that substrates for setting stone cladding are firm, dry, clean, free of coatings that are incompatible with stone cladding-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 1. Cement Plaster and Concrete Substrate:
 - a. TCNA installation standards require a substrate to meet a maximum variation of 1/4 -inch (6.35 mm) in 10 -feet (3048 mm) for both vertical and horizontal thin-bed stone cladding installation.

- b. Scratch and brown coat shall be smooth in accordance with liquid applied waterproof membrane manufacturers written recommendations prior to proceeding with installation.
- 2. Substrate flatness shall not exceed **1/16 -inch (1.58 mm)** deviation in the substrate at the longest dimension of the stone cladding or stone.
- 3. For large format stone cladding the substrate cannot exceed **1/16 -inch (1.58 mm)** of irregularity in flatness in **24 -inch (609.6 mm)**. A substrate that exceeds these standards must be filled with an appropriate self-leveling underlayment or ground to the correct tolerance, not filled with additional mortar.
- E. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind stone cladding has been completed.
- F. Verify that joints and cracks in stone cladding substrates are coordinated with stone cladding joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- G. For the Record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of dimension stone cladding.
- H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements relating to placement of inserts, flashing reglets, metal anchors, and similar items to be used by stonework installer for anchoring, supporting, and flashing of dimension stonework.
 - 1. Furnish installers of other work with Drawings or templates showing locations of these items.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Protect surrounding area from possible damage during installation work.
- D. Blending: For stone cladding exhibiting color variations, verify that stone cladding has been factory blended and packaged so units taken from one package show same range of colors as those taken from other packages and match approved Samples.
 - 1. If not factory blended, blend stone cladding at Project site before installing which would include a minimum of three full pallets of product at a time.
- E. For concrete substrates for stone cladding installed with adhesives or thin-set mortar, correct conditions that do not comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
 - a. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- F. Prior to setting, clean adhered stone cladding unit surfaces that have become dirty or stained to remove soil, stains, and foreign materials.
 - 1. Clean units by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water.

2. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives and recommended for this use by manufacturer.

G. Initiating installation constitutes Installer's acceptance of substrates

3.3 WATERPROOF MEMBRANE

- A. Install liquid applied waterproof membrane over cement plaster scratch and brown coat in accordance with manufacturers written recommendations.
 1. Clean substrate thoroughly in accordance with manufacturers written recommendations.
- B. Install waterproofing at exterior locations to comply with ANSI A108.10 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- C. Do not install cladding units or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.4 SETTING DIMENSION STONE CLADDING, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials.
 1. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water.
 2. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Execute dimension stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.
 1. Use power saws with diamond blades to cut stone.
 2. Produce lines cut straight and true, with edges eased slightly to prevent snipping.
- C. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.

3.5 SETTING DIMENSION STONE CLADDING WITH MORTAR - THINSET

- A. Set dimension stone cladding with fortified thin set mortar unless otherwise indicated.
- B. Set dimension stone cladding with mechanical anchors where indicated on Drawings.
- C. Set stone in full bed of thin set mortar with head joints filled unless otherwise indicated.
 1. Back butter cladding as required by thinset manufacturer.
 2. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding.
 - a. Hold buttons back from face of stone a distance at least equal to width of joint, but not less than depth of pointing materials.

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3. Do not set heavy units or projecting courses until thin set mortar in courses below has hardened enough to resist being squeezed out of joint.
 4. Support and brace projecting stones until wall above is in place and thin set mortar has set.
 5. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone.
 - a. Fill remainder of anchor holes and kerfs with mortar.
- D. Fill space between back of stone units and backup wall solidly with thin set mortar .
- E. Embed ends of sills in mortar; leave remainder of joint open until final pointing.
- F. Rake out thinset mortar from sealant-pointed joints to depths required for sealant and sealant backing but not less than **1/2 -inch (12 mm)**.
1. Rake joints to uniform depths with square bottoms and clean sides.
- G. Set the following dimension stone cladding with unfilled head joints for installing joint sealants:
1. Wainscots

3.6 SETTING MECHANICALLY ANCHORED DIMENSION STONE CLADDING

- A. Set dimension stone cladding with mechanical anchors as indicated on Drawings, otherwise fully adhere stone.
- B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.
- C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
- D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.7 JOINT-SEALANT INSTALLATION

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 07 9213 "Exterior Façade Joint Sealants."
 1. Install at all joints between stone and dissimilar materials.
 2. Custom color as directed by Architect.

3.8 SUBSTRATE TOLERANCE

- A. Flatness: Do not exceed **1/8 -inch** +/- variation in **10 -feet**, non-cumulative.

3.9 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 -inch in 10 -feet (6 mm in 3 m), 3/8 -inch in 20 -feet (10 mm in 6 m), or 1/2 inch in 40 feet (12 mm in 12 m) or more.
 - 1. For external corners, corners and jambs within 20 -feet (6 m) of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 -inch in 10 -feet (3 mm in 3 m), 1/4 -inch in 20 -feet (6 mm in 6 m), or 3/8 -inch in 40 -feet (10 mm in 12 m) or more.
- B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 -inch in 10 -feet (3 mm in 3 m), 1/4 -inch in 20 -feet (6 mm in 6 m), or 3/8 -inch (10 mm) maximum.
- C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 -inch in 20 -feet (6 mm in 6 m) or 1/2 -inch in 40 -feet (12 mm in 12 m) or more.
- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 -inch (6 mm).
- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 -inch (3 mm) or a quarter of nominal joint width, whichever is less.
 - 1. For joints within 60 -inches (1500 mm) of each other, do not vary more than 1/8 -inch (3 mm) or a quarter of nominal joint width, whichever is less from one to the other.
- F. Variation in Plane between Adjacent Stone Units (Lipping):
 - 1. Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units.

3.10 FIELD QUALITY CONTROL

- A. Architect will observe appearance of installed units; installed masonry surfaces shall be free of imperfections which detract from overall appearance when viewed from a distance of 5 -feet (1.5 m) at 90 degrees normal to surface.
- B. Refer to Section 01 4553 "Façade Mockup Testing"
- C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- D. Perform three tests for each 500 square -feet of adhered masonry veneer in locations selected by the Architect.
- E. Provide water intrusion mockup testing of portion of stone cladding assembly in conjunction with exterior window wall / curtain wall testing.
 - 1. Refer to Section 01 4553 "Façade Mockup Testing"
- F. Perform the following test on mockups and representative areas.
 - 1. Shear Tests: Perform modified version of ASTM C482 substituting the pure Portland cement paste bond coat with the specified thin-set mortar as described in Tile Exterior Shear Bond Strength Testing Report , CTIOA Technical Bulletin No. 2010-3-23.
 - 2. Test a minimum of six areas on each building facade.
 - 3. Repair installation areas damaged by testing.

EXTERIOR STONE CLADDING (ADHERED)

4. Perform Bond Strength Testing of the adhered masonry veneer, in accordance with ASTM C482.
- G. The test is destructive. Repair damage caused by testing and failed areas to match adjacent undisturbed work.
- H. Defective Work:
 1. Stone cladding will be considered defective if assemblies do not pass tests and inspections.
 2. Stone cladding will be considered defective if, in the opinion of the Architect, assemblies' exhibit poorly blended tile or unacceptable ranges of colors or textures beyond those demonstrated in Verification Samples and Approved Mock-ups.
 3. Replace defective work as directed, at no additional costs.
- I. Prepare test and inspection reports.

3.11 ADJUSTING

- A. Cutting and Fitting: Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other sections of work to provide correct size, shape, and location, visually consistent and uniform.

3.12 GROUTING

- A. Joints shall be packed full and free of all voids or pits, joints shall not be raked. Excess grout shall be cleaned from the surface with water as work progresses. Cleaning shall be done while mortar is fresh and before it hardens on the surface.
- B. Epoxy type:
 1. Grout shall be installed in accordance with ANSI A108.3 and A108.6 for epoxy and the manufacturer's recommended procedures and precautions during application and cleaning.
- C. Epoxy Emulsion type:
 1. Grout shall be installed in accordance with ANSI A108.6 and A118.3 for epoxy emulsion type and the manufacturer's recommended procedures and precautions during application and cleaning.

3.13 REPAIR

- A. Remove and replace broken, chipped, stained, or otherwise damaged stone cladding, defective joints, and dimension thin brick that does not match approved samples and mockups or repair stone cladding work including the following description:
 1. Defective joints.
 2. Stone cladding and joints not matching approved samples and field-constructed mock-up.
 3. Work not complying with other requirements indicated.

3.14 CLEANING AND PROTECTION

- A. Comply with Section 01 7400 "Cleaning and Construction Waste Management"
- B. On completion of placement and grouting, clean all stone cladding surfaces so they are free of foreign matter.
 - 1. Clean grout smears and haze from stone cladding according to stone and grout manufacturer's written instructions.
 - a. Use only cleaners recommended by stone and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of thin brick and other surfaces to be cleaned.
 - 2. Protect adjacent surfaces and fixtures from effects of cleaning.
 - 3. Flush surfaces with clean water before and after cleaning.
 - 4. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to thin brick and grout manufacturer.
 - 5. Trap and remove coating to prevent drain clogging.
- C. Protect installed stone cladding work with heavy covering during construction period to prevent staining, damage, and wear.
 - 1. If recommended by stone cladding manufacturer, apply coat of neutral protective cleaner to completed stone cladding walls.
- D. Use only nonmetallic tools in cleaning operations.
 - 1. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods which could cause damage, discoloration, etching of surfaces or joints.
- E. Unused products: Uncut stone cladding and unopened containers of grout shall be left for the Owner's use.
- F. In-Progress Cleaning: Clean dimension stone cladding as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant and smears as sealant is installed.
- G. Final Cleaning:
 - 1. Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes.
 - 2. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

3.15 SEALING

- A. Refer to Section 07 1900 "Water Repellent & Graffiti Resistant Coatings".

3.16 EXTERIOR WALL STONE CLADDING INSTALLATION SCHEDULE

- A. Exterior Wall Installation: (Cement Plaster scratch and brown coat)
1. Installation TCNA **W201 STONE**: Thin-set fortified mortar over Waterproof / Anti-fracture membrane over previously installed cement plaster scratch and brown coat (not cement backer board) over sheathing and over framing.
 - a. Cement plaster scratch & brown substrate: As specified
 - b. Liquid applied Waterproof / Anti-Fracture membrane over substrate: Per manufacturers written recommendations
 - c. Thin-Set adhesive Mortar: Per manufacturers written recommendations.
 - d. Grout: Per manufacturers written recommendations.
 - e. Expansion Joints: TCNA EJ171E
 - f. Sealer:
 - 1) Refer to Section 07 1900

- END OF SECTION -

- SECTION 04 7300 -**MANUFACTURED ADHERED STONE MASONRY
VENEER**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Manufactured (Simulated) Stone Adhered Masonry Veneer
 - 1. Interior Use
 - 2. Exterior Use

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4339 "Mockup Requirements"
- C. Section 01 4553 "Façade Mockup Testing"
- D. Section 04 2115 "Adhered (Thin) Brick Veneer"
- E. Section 04 2000 "Unit Masonry"
- F. Section 07 1900 "Water Repellent & Graffiti Resistant Coatings"
- G. Section 07 2500 "Fluid-Applied Membrane Air Barriers" for water-resistive barrier.
- H. Section 07 6200 "Sheet Metal Flashing & Trim" for metal and PVC flashings at openings to be installed in conjunction with material in this section to prevent water infiltration into the structure.
- I. Section 07 9200 "Joint Sealants" for Interior applications.
- J. Section 07 9213 "Exterior Façade Joint Sealants" for exterior applications.
- K. Section 09 2236 "Metal Lath & Accessories"
- L. Section 09 2513 "Acrylic Modified Portland Cement Plastering"

MANUFACTURED ADHERED STONE MASONRY VENEER

- M. Section 09 2116 "Gypsum Board Assemblies"
- N. Products installed, but not furnished, under this Section include the following:
- O. Steel Lintels and Shelf Angles for adhered masonry veneer, furnished under Section 05 50 00 (05500), Metal Fabrications.
- P. Hollow-metal frames in adhered masonry veneer openings, furnished under Section 08 11 13, Hollow Metal Doors and Frames.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)
 - 1. C144 "Standard Specification for Aggregate for Masonry Mortar"
 - 2. C144 "Standard Specification for Aggregate for Masonry Mortar"
 - 3. C207 "Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (Re-approved 1997)"
 - 4. C482 "Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste".
- C. ACI 530 / ASCE 5 / TMS 402, 2011 "Building Code Requirements and Specification for Masonry Structures and Related Commentaries".

1.5 DEFINITIONS

- A. Simulated Stone: Architectural precast stone units intended to simulate natural stone.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of simulated stone, accessory, and other manufactured products, including certifications that each type complies with specified requirements.
- B. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- C. Samples for verification purposes of simulated stone in form of sets for each color, grade, finish, type, and variety of simulated stone required.
- D. Colored pointing mortar and grout samples for each color required showing full range of exposed color and texture to be expected in completed work.
- E. Shop Drawings detailing fabrication and installation of adhered masonry veneer. Include setting Drawings indicating sizes, dimensions, sections, and profiles of stones, arrangement and

provisions for jointing, supporting, anchoring, and bonding stonework, and details showing relationship with, attachment to, and reception of related work.

- F. Include building elevations showing layout of units and locations of joints and anchors.
- G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.7 INFORMATIONAL SUBMITTALS

- A. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700.
 - 2. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing simulated stone similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.
- B. Single-Source Responsibility for Simulated stone: Obtain each color, grade, finish, type, and variety of stone from a single manufacturer with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to mold and finish material without delaying the progress of the work.
- C. Single-Source Responsibility for Mortar and Grout Materials: Obtain mortar ingredients of uniform quality and from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.
- D. Single-Source Responsibility for Other Materials: Obtain each type of simulated stone accessory, sealant, and other materials from one manufacturer for each product.
- E. Installer Qualifications; Engage an experienced installer who has completed stone cladding similar in material, design, and extent to that indicated for project that has resulted in construction with a record of 5 years of successful in-service performance.
- F. Sample Panels: Before installing adhered masonry veneer, build sample panels, using materials indicated for the completed Work, to verify selection and to demonstrate aesthetic effects. Build sample panels for each type of exposed simulated stone assembly in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 1. Locate panels in the locations indicated or, if not indicated, as directed by Owner's Representative.
 - 2. Build mock-ups for the following types of dimension stonework:
 - a. Typical exterior simulated stone of each type, full size in conjunction with mock-up for EIFS or face brick. Illustrate field pattern of stone and color and tooling of joints.
 - b. Mockups may be incorporated into the work. If not, retain mock-ups during construction as standard for judging completed dimensions stonework. When directed, demolish mock-ups and remove from site.
 - 3. Clean exposed faces of panels with masonry cleaner indicated.

4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by the Owner's Representative in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by the Owner's Representative in writing.
6. Demolish and remove sample panels when directed.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project in undamaged condition in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 1. Do not use pinch or wrecking bars.
 2. Lift with wide-belt-type slings where possible. Do not use wire rope or ropes containing tar or other substances that might cause staining. Move stone with wood rollers with cushions at end of wood slides.
 3. Store simulated stone on wood skids or pallets covered with nonstaining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Allow air to circulate around stones.
 4. Store cementitious materials off the ground, under cover, and in dry location.
 5. Do not use salt or calcium-chloride to remove ice from simulated stone surfaces.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Store simulated stone accessories, including metal items, to prevent deterioration by corrosion and accumulation of dirt.

1.10 PROJECT/SITE CONDITIONS

- A. Protection of Work: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed simulated stone when construction is not in progress.
- B. Staining: Prevent grout, mortar, and soil from staining the face of simulated stone to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such simulated stone.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by means of coverings spread on ground and over wall surface.
- C. Environmental Requirements:
 1. Ambient air temperature shall be in accordance with manufacturer's requirements.

2. Maintain materials and surrounding air temperature to minimum 40 degrees prior to, during, and for 48 hours after completion of work.
3. Protect materials from rain, moisture, and freezing temperatures prior to, during, and after 48 hours after completion of work.
4. Allow no construction activity on opposite side of wall during installation, and for 48 hours after completion of work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. General: Fabricate and install simulated stone adhered masonry veneer to withstand loads from wind, gravity, movement of building structure, and thermally induced movement, as well as to resist deterioration under conditions of normal use including exposure to weather, without failure.
- D. Provide hand-set (field-installed) anchoring system, including connections to building structure, that is capable of sustaining forces generated by gravity loads, wind loads, and stresses induced by thermal movement, acting separately or in combination, within the indicated parameters.
- E. Regulatory Requirements: Adhered masonry veneer shall comply with the applicable requirements in Section 1405.9.1 and Sections 6.1 and 6.3 of ACI 530 / ASCE 5 / TMS 402.
 1. 6.3.2.1 Unit sizes - Adhered veneer units shall not exceed **2 5/8 inch** (66.7 mm) in specified thickness, **36 inch** (914 mm) in any face dimension, nor more than **5 square feet** (0.46 meter squared) in total face area, and shall not weigh more than **15 pounds** per square foot (718 Pa).
 2. 6.3.2.2 Wall Area Limitations - The height, length, and area of adhered veneer shall not be limited except as required to control restrained differential movement stresses between veneer and backing.
 3. 6.3.2.3 Backing - Backing shall provide a continuous, moisture resistant surface to receive the adhered veneer. Backing is permitted to be masonry, concrete, or metal lath and portland cement plaster applied to masonry, concrete, steel framing or wood framing.
 4. 6.3.2.4 Adhesion developed between adhered veneer units and backing shall have a shear strength of at least **50 psi** (345 kPa) based on gross unit surface area when tested in accordance with ASTM C482.

2.2 MATERIALS - GENERAL

- A. Comply with referenced standards and other requirements indicated applicable to each type of material required.

2.3 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. "Cultured Stone"; [Cultured Stone, Division of Owens Corning](#) (800-255-1727)
 - 2. "Eldorado Stone"; [Eldorado Stone, A Headwaters Company](#) (800-925-1491)
 - 3. Approved Substitution
- C. Sizes and Shapes: As indicated in Finish Index.
- D. Color & Texture: As indicated in Finish Index.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: [ASTM](#) C150, Type I, of natural color or white, as needed to produce color indicated.
- B. Hydrated Lime: [ASTM](#) C207, Type S
- C. Aggregate: [ASTM](#) C144, and as indicated below:
 - 1. For joints narrower than 1/4 inch, use aggregate graded with 100percent passing the No. 8 sieve and 95 percent the No. 16 sieve.
 - 2. For pointing mortar, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White Mortar Aggregates: Natural white sand or ground white stone.

2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
 - 1. Products: Provide the following:
 - a. Laticrete 9235.

2.6 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of Division 7 Section "Exterior Facade Joint Sealants," including ASTM C 920 as referenced by Type, Grade, Class, and Uses.
- B. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- C. Colors: Provide custom colors of exposed sealants to match colors as selected by Architect.
- D. Single component, Neutral Cure, Nonsag, 100% Silicon Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT, I, M, and G; capable of 25% extension and compression movement.

MANUFACTURED ADHERED STONE MASONRY VENEER

1. "Latasil"™ by Laticrete, VOC (37.16 g/L)
2. Primer, as recommended by manufacturer.

2.7 ACCESSORIES

- A. Weather Barriers, Building Paper and Flexible Flashing: As specified in Section 07 2500 "Fluid-Applied Membrane Air Barriers".
- B. Metal Lath-Reinforced Plaster Base (Brown and Scratch Coat): Type specified in Section 09 2513 "Acrylic Modified Portland Cement Plastering"
- C. Water Repellent Coating: Type specified in Section 07 1900.
- D. Fasteners: Stainless steel 1-1/2 inch screws of type and for spacing as recommended by thin brick veneer manufacturer to resist imposed loads.
- E. Cleaner: Nonacid cleaner as recommended by adhered veneer manufacturer

2.8 SIMULATED STONE FABRICATION

- A. General: Fabricate simulated stone in sizes and shapes required to comply with requirements indicated, including details on Drawings and final Shop Drawings.
- B. Carefully inspect finished stones at fabrication plant for compliance with requirements relative to qualities of appearance, material, and fabrication. Replace defective stones with ones that do comply.

2.9 MORTAR AND GROUT MIXES

- A. General: Comply with referenced standards and with manufacturers' instructions relative to mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality and with optimum performance characteristics.
 1. Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or calcium chloride, unless otherwise indicated.
 2. Mixing: Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer, unless otherwise indicated. Discard mortars and grout when they have reached their initial set.
- B. Portland Cement/Lime Setting Mortar for Nonpaving Installations: Comply with ASTM C 270, Proportion Specification, for types of mortars and stone indicated below:
 1. Set stone with Type N mortar. Color as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive simulated stone work, and conditions under which materials will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of dimension stonework. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of simulated stone work.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements relating to placement of inserts, flashing reglets, metal anchors, and similar items to be used by stonework installer for anchoring, supporting, and flashing of dimension stonework. Furnish installers of other work with Drawings or templates showing locations of these items.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Sheathed Surfaces: Verify Metal Lath-Reinforced Plaster Base (Brown and Scratch Coat) is installed in accordance with requirements of related section.
- D. Concrete and Masonry Surfaces: Verify Metal Lath-Reinforced Plaster Base (Brown and Scratch Coat) is installed in accordance with requirements of related section.

3.3 MORTAR BED INSTALLATION

- A. Metal Lath-Reinforced Plaster Base (Brown and Scratch Coat) Mortar bed specified in Section 09 2513 "Acrylic Modified Portland Cement Plastering".

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing at exterior locations to comply with ANSI A108.10 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install adhered masonry veneer or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 ADHERED MASONRY VENEER INSTALLATION

- A. Comply with manufacturer's product data, including product technical bulletins and installation instructions.
- B. General: Install/set all units and accessories accurately, using skilled, experienced personnel, according to approved shop and setting drawings.
 - 1. Use stone-fitters to perform field-cutting with power saws, when required.
 - a. Cut masonry units with wet-saw.

MANUFACTURED ADHERED STONE MASONRY VENEER

- C. Clean stone surfaces before setting, using only water or mild cleaning compounds containing no caustic or abrasives. Clean cut units using a stiff fiber brush and clean water. Allow units to surface dry prior to placement.
- D. Provide chases, reveals, openings, and other spaces required to accommodate other work. Close up after other work is complete with materials matching stone already set.
- E. Mortar: Apply 3/4 inch of mortar to lath, covering a maximum of 10 square feet at one time. Press the units firmly into position in soft mortar bed, wiggle and apply slight pressure to unit to ensure firm bonding causing mortar to extrude slightly around edges of units.
 - 1. For stones applied in hot or dry weather, the back of each piece shall be moistened with a fine spray of water or a wet brush to adequately prevent excessive absorption of moisture from the mortar. If being installed over concrete, masonry or scratch coat substrate, the substrate surface area should also be dampened before applying mortar.
 - 2. Applications should be protected from freezing, as mortar will not set up properly under such conditions. Do NOT use antifreeze compounds to lower the freezing point of mortar.
- F. Exterior Masonry Flashing: Extend flashing through veneer, turn up and bed into mortar joint of masonry, seal to concrete or seal into sheathing over steel stud framed back-up.
 - 1. Lap end joints and seal watertight.
- G. Lintels: Install lintels as scheduled.
- H. Joints:
 - 1. Mortar joints should not be over 1/2-inch to 3/4-inch in width. Set simulated stone accurately, in patterns and locations indicated, with uniform joints of dimensions indicated, and with edges and faces aligned according to established relationships and indicated tolerances.
 - 2. When installing "pre-fitted" stone textures, units should be fitted tight against each other with no allowance for mortar joints.
 - 3. Remove excess mortar; do not allow mortar to set up on face of units. Point, [rake] and tool joints before mortar have set.
- I. Movement Control Joints
 - 1. Construct movement joints in locations noted on Drawings. If Drawings do not include movement joints, propose joint locations allowing necessary movement to Architect for approval.
 - 2. Do not continue horizontal joint reinforcing across movement control joints.
 - 3. Form movement control joints by leaving head joints between stacked units void of mortar, ready for application of bond breaker and joint sealant.
 - 4. Size joint for optimum joint performance with specified sealant.
- J. Setting Units: Press each stone into the mortar setting bed firmly enough to squeeze some mortar out around the stone's edges. Apply pressure to the stone to ensure a good bond. Ensure complete coverage between the mortar bed and the surface of the stone. Mortar may also be applied to the entire back of the stone.
- K. Shim and adjust anchors, supports, and accessories.
- L. Mortar Color: As indicated in Finish Index.

3.6 PROTECTION

- A. Protect adhered masonry veneer work during erection as follows:
 - 1. Cover top of walls with nonstaining waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
 - 2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials from stone without damage to latter.
 - 3. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - 4. Protect sills, ledges, and projections from droppings of mortar and sealants.
- B. Provide final protection and maintain conditions in a manner acceptable to fabricator and installer ensuring dimension stonework being without damage or deterioration at time of Substantial Completion.

3.7 FIELD QUALITY CONTROL

- A. Architect will observe appearance of installed units; installed adhered masonry veneer surfaces shall be free of imperfections which detract from overall appearance when viewed from a distance of 5 feet (1.5 m) at 90 degrees normal to surface under lighting conditions prevailing in the finished work.
- B. Perform Bond Strength Testing of the adhered masonry veneer, in accordance with ASTM C482.
 - 1. Perform three tests for each 500 square feet of adhered masonry veneer in locations selected by the Architect.
 - 2. The test is destructive. Repair damage caused by testing and failed areas to match adjacent undisturbed work.
- C. Provide water intrusion mockup testing of portion of adhered masonry veneer in conjunction with exterior window wall / curtain wall testing.
 - 1. Refer to Section 01 4553 "Façade Mockup Testing"

3.8 ADJUSTING AND CLEANING

- A. General: Perform final cleaning as soon as possible after mortar has set and been tooled. Clean faces of stone at pointed joints immediately. Remove soiled areas, streaks and stains from prefinished panels using clean water and soft bristle brush, followed by clear water rinse.
- B. Use no wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods which could damage, discoloration, etching of surfaces or joints, without written approval from simulated stone manufacturer.
- C. Clean adhered masonry veneer surfaces that have become dirty or stained prior to setting to remove soil, stains, and foreign materials. Clean stones by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives.
- D. Remove and replace or repair adhered masonry veneer work of the following description:

MANUFACTURED ADHERED STONE MASONRY VENEER

1. Broken, chipped, stained, or otherwise damaged stones. Broken, chipped, stained, or otherwise damaged stone may be repaired, providing the methods and results are acceptable to Architect.
 2. Defective joints.
 3. Stones and joints not matching approved samples and field-constructed mock-up.
 4. Work not complying with other requirements indicated.
- E. Replace in manner that results in adhered masonry veneer matching approved samples and field-constructed mock-ups, complying with other requirements, and showing no evidence of replacement.
- F. Remove protection materials upon substantial performance of the work or when risk of damage is no longer present.

- END OF SECTION -

DIVISION 05 – METALS

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Section 05 5150 Architectural Metal Stairs	05 5150-1; 10
Section 05 5213 Pipe and Tube Railings	05 5213-1; 9
Section 05 5300 Metal Gratings	05 5300-1; 10
Section 05 7000 Decorative Metal	05 7000-1; 23
Section 05 7300 Decorative Metal and Glass Railings	05 7300-1; 10

- SECTION 05 0605 -**WELDED STUD CONNECTORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Principal work in this Section:
 - 1. Welded stud connectors including the following, but not limited to;
 - a. Embeds for vertical structural steel support structure for;
 - 1) Custom Steel Canopies
 - 2) As indicated on drawings
 - 3) Stairs.
 - 4) Operable Panel Partitions
 - 5) Exterior Glazed Panel Folding Doors

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 3300 "Submittal and Substitution Procedures".
- C. Section 01 4000 "Quality Requirements".
- D. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- E. Section 05 0810 "Galvanized Finishes for Steel" for galvanized finishes, and repair priming and painting of damaged galvanized finishes.
- F. Section 05 1200 "Structural Steel Framing"
- G. Section 05 1213 "Architectural-Exposed Structural Steel (AESS) Framing".
- H. Section 05 5000 "Metal Fabrications".
- I. Section 05 5100 "Pre-Fabricated Metal Stairs"

- J. Section 05 5150 "Architectural Metal Stairs"
- K. Section 08 3214 "Exterior Glazed Panel Folding Doors"
- L. Section 09 9600 "High-Performance Coatings".
- M. Section 10 2238 "Operable Panel Partitions"
- N. Section 10 7316 "Custom Steel Canopies"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Manufacturer's technical product data, including detailed equipment and installation requirements.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Samples: Full size, when requested by Owner and/or Architect.

1.6 QUALITY ASSURANCE

- A. Reference standards: The applicable provisions of the following govern the work of this Section, except as noted.
 - 1. ASTM A108: Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - 2. AWS D1.1 Structural Welding Code, Steel.
 - 3. ICC Report ESR-2856 or equivalent.
- B. Welder's qualifications:
 - 1. Currently certified and qualified in compliance with AWS D1.1.
 - 2. Testing for recertification is Contractor's responsibility.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

WELDED STUD CONNECTORS

- B. Protection: Protect materials from damage during shipping, handling and storage at the site.
- C. Delivery: In unbroken sealed packages bearing manufacturer's name and label identifying the contents.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MATERIALS

- A. Studs: Nelson Headed Anchor Studs (ESR-2856) manufactured by Nelson Stud Welding, Inc., or equal complying with the following.
 - 1. Standard steel studs for welding by automatically timed stud-welding equipment, furnished complete with an arc shield (ferrule) of heat-resistant ceramic or equivalent for all studs, and, for studs **5/16 -inch** diameter or larger, a deoxidizing and arc stabilizing flux; not painted, galvanized, or cadmium-plated prior to welding and all finished by cold-heading, cold-rolling or machining.
 - 2. Provide studs of uniform quality and condition, free of injurious laps, fins, seams, cracks, twists, bends not indicated, rust, rust pits, scale, oil and other injurious defects or substances.
 - 3. Steel shall be Grade C-1015, C-1017 or C-1020, cold-drawn, conforming to ASTM A108 and having minimum 60,000 psi tensile strength with 20% elongation in **2 -inch** and 50% area reduction.
- B. Welding equipment: Automatically timed stud-welding equipment with a suitable power source, type and manufacture approved by the stud manufacturer.

EXECUTION

2.3 PREPARATION

- A. Clean steel surfaces to receive studs of paint, scale, rust and other foreign substances by wire brushing, peening, prick-punching, grinding or other method required to produce clean, bare substrates.

2.4 STUD WELDING

- A. General: Comply with stud manufacturer's printed instructions and the following.
- B. Installation:
 - 1. General:

- a. Do not install studs on wet surfaces.
 - b. Do not install studs showing defects, rusting, rust pits, scale, oil or other deleterious substances.
 - c. Install studs promptly after cleaning and preparation.
 - d. Break and remove arc shield after welding.
 - e. Free welded studs from defects or substances that interfere with intended functions.
2. Lacing locations:
- a. The longitudinal and lateral spacing for stud connectors with respect to each other and to edges of member flanges may vary **1 -inch** maximum from locations shown provided adjacent studs are not closer than **2-1/2 -inch** o.c.
 - b. Provide a minimum distance between edges of stud bases and flange edges equal to the stud diameter plus **1/8 -inch**, but minimum **1-1/2 -inch** clearance where possible.
 - c. Location accuracy of other types of studs shall permit the assembly of attachments without alterations or reaming.
2. Stud lengths:
- d. Stud lengths indicated are minimum net lengths after welding.
 - e. If reduction in length of a stud as it is welded is such that the length of the stud is more than **1/16 -inch** greater than specified by stud manufacturer, discontinue installation until cause is determined and eliminated, and pre-production testing is satisfactorily repeated.
3. Defective fillets: Studs not showing a full 360-degree weld fillet after welding may be repaired by adding a **3/16 -inch** fillet weld in lieu of the missing weld fillet in compliance with AWS D1.1 and using low-hydrogen electrodes.

2.5 REPLACING DEFECTIVE STUDS

- A. Preparation for replacement studs and repairs: Repair steel surfaces as follows wherever a defective stud is removed.
1. Make the areas where a stud is removed flush and smooth.
 2. Complete repairs before installing a replacement stud on a defective area.
- B. Areas subject to tensile stress:
1. Make areas flush and smooth.
 2. If base metal has been pulled-out by the stud removal, fill the pocket by shielded metal-arc welding conforming to AWS D1.1 using low-hydrogen electrodes, and grind the weld surfaces flush.
- C. Areas subject to compression:
1. Where the stud failure is confined to shanks or fusion zones of the studs, a new stud may be installed adjacent to the defective area in lieu of repairing the defective area and installing a replacement stud, subject to approval.
 2. If metal is pulled-out of the base metal, fill the pocket as specified above for tensile areas except that if defect depth is not more than the lesser of **1/8 -inch** or **7 percent** of the base metal thickness, the defect may be faired by grinding in lieu of weld filling.

2.6 FIELD QUALITY CONTROL

- A. Inspection:
1. Perform pre-production testing, stud installation and production testing under continuous inspection.
 2. In addition to the standard reports, Testing Laboratory reports shall detail the location of defective studs with repair or replacement action taken, damage resulting from stud installation, and all defects and unusual occurrences.
- B. Pre-production testing: Perform the following tests with each welding equipment power source at the start of each production period (time interval from start-up to any shut-down of any stud-welding equipment), at the start of any new welding procedure, and after any change in the welding procedure.
1. Stud shear connectors: After cooling, test the first 2 studs on a member by hammer bending to a 45 degree angle. If a failure occurs in the weld zone of either stud, correct the procedure, and weld and bend test 2 more studs on the member. If either of the second 2 studs fails, continue all additional welding on separate materials until 2 consecutive studs are tested and found satisfactory before any more studs are welded to the member.
 1. Studs other than shear connectors: Weld 2 studs to separate material in the same general position (such as flat, vertical, sloping or overhead) and of similar steel material and thickness as members to receive studs. After cooling, hammer bend the studs to a 30 degree angle. If failure occurs in the weld zone of either stud, correct the procedure and successfully weld and test 2 successive studs before any studs are welded to members.
- C. Production inspection and testing:
1. Inspection of stud shear connectors: After cooling, test at least one stud on each member by hammer bending to a 15 degree angle; if a failure occurs either in the weld zone or stud shank, follow the method of correction as required herein for pre-production testing until successful installations are produced, and replaced defective studs. Test studs not showing a full 360 degree fillet weld or that have been repaired by welding, all replacement studs, and any stud in which reduction in length is less than correct by hammer bending to a 15 degree angle. For studs showing less than a 360 degree weld fillet, bend stud in the direction opposite to the missing weld fillet. Remove and replace studs that crack either in the weld zone, base metal or shank under inspection and testing or under subsequent straightening.
 2. Inspection of studs other than shear connectors: Test at least one stud in every one hundred studs by hammer bending to a 15 degree angle or, if the stud is threaded, torque test with a calibrated torque wrench to an approved value for stud diameter and thread in an approved device. If the stud fails, correct the welding procedure as required herein for pre-production testing and bend or torque test 2 more in-place studs. If either of the 2 second studs fails, all studs represented by the tests shall be bent or torque tested, or shall be rejected and replaced. The extent of additional inspection and testing for critical structural connections shall be as designated by the Owner.

- D. Straightening:
1. Leave in a bent condition those stud shear connectors and shear transfer devices that are bent less than 16 degrees and are free of failure provided no portion of the studs is within **1 -inch** of an exposed concrete surface.
 2. Perform stud bending and straightening without heating and before completion of each day's stud welding.
 3. Obtain inspection and approval of straightened studs before covering.
- E. Load testing: Testing laboratory shall load test studs in the extent and by methods directed.

- END OF SECTION -

- SECTION 05 0810 -

GALVANIZED FINISHES ON STEEL

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes Hot-dip galvanized finish on steel and iron materials, applied after materials are fabricated or manufactured.
 - 1. Products include but are not limited to:
 - a. Steel forgings.
 - b. Iron castings.
 - c. Fasteners and miscellaneous hardware.
 - d. Steel and iron pipe.
 - e. Structural steel members exposed outside of building enclosure.
 - f. Exterior steel components of Canopies
 - g. Steel fabrications, including bollards, fixed metal ladders (roof access ladders) and trash enclosure gates.
 - 2. Products to receive galvanized finish shall be those subject to weather exposure and those located in moist and high-humidity conditions.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 3300 "Submittal And Substitution Procedures".
- C. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- D. Section 03 2000 "Concrete Reinforcing".
- E. Section 05 1200 "Structural Steel Framing".
- F. Section 05 1213 "Architecturally Exposed Structural Steel (AESS) Framing" for: exposed exterior steel framing to be galvanized.
- G. Section 05 3100 "Steel Decking" for factory galvanizing of decking.

- H. Section 05-4000 "Cold-Formed Metal Framing" for factory galvanizing of framing.
- I. Section 05 5000 "Metal Fabrications" for metal fabrications to be galvanized.
- J. Section 05 5213 "Pipe and Tube Railings".
- K. Section 09 2216 "Non-Structural Metal Framing" for factory galvanizing of framing.
- L. Section 09 9600 "High-Performance Coatings" for field-applied finish on exterior galvanized elements.
- M. Section 10 7316 "Custom Steel Canopies"
- N. Section 10 7318 "Glass and Glass Covered Canopies"
- O. Section 10 8213 "Exterior Screened Enclosures" for roof top mechanical screens.
- P. Pertinent Sections specifying steel fabrications and assemblies with galvanized finish which are to be furnished and installed.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Research Council on Structural Connections of the Engineering Foundation:
 - 1. Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- C. American Galvanizers Association (AGA) www.galvanizeit.org
 - 1. Inspection of Hot-Dip Galvanized Steel Products.
 - 2. The Design of Products to be Hot-Dip Galvanized After Fabrication.
 - 3. Recommended Details for Galvanizing Structures.
 - 4. Quality Assurance Manual
 - 5. Galvanizing for Sustainable Design
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM A53 Standard Specification for Pipe, Steel, Black And Hot-Dipped, Zinc-Coated, Welded And Seamless.
 - 2. ASTM A90 Standard Test Method for Weight Of Coating On Zinc-Coated (Galvanized) Iron And Steel Articles.
 - 3. ASTM A123 / A123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A143 Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - 5. ASTM A153 / A153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 6. ASTM A307 Standard Specification For Carbon Steel Externally Threaded Standard Fasteners.
 - 7. ASTM A325 Standard Specification For High-Strength Bolts For Structural Steel Joints

8. ASTM A390 Standard Specification For Zinc-Coated Steel Chain-Link Fence Fabric
9. ASTM A392 Standard Specification For Zinc-Coated Steel Chain-Link Fence Fabric
10. ASTM A394 Standard Specification For Galvanized Steel Transmission Tower Bolts
11. ASTM A384 Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
12. ASTM A385 Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
13. ASTM A449 Standard Specification For Quenched And Tempered Steel Bolts And Studs
14. ASTM A740 Standard Specification For Hardware Cloth (Woven Or Welded Galvanized Steel Wire Fabric)
15. ASTM A767 / A767M Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
16. ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
17. ASTM B6 Standard Specification For Zinc (Slab Zinc)
18. ASTM D6386 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
19. ASTM E376 Standard Recommended Practice For Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.

E. American Welding Society (AWS):

1. Publication entitled; Welding Zinc-Coated Steel

F. Federal Specifications:

1. DOD-P-21035 Paint, High Zinc Dust Content, Galvanizing Repair.
2. MIL-P-26915 Primer Coating, Zinc Dust Pigmented.

G. Manufacturer's recommendations and specifications.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 1. Data for galvanized finish.
- D. VOC Submittals:
 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

B. Certification:

1. Submit the coating applicator's Certificate of Compliance that hot-dip galvanized coatings meet or exceed the specified requirements of ASTM A123 / A123M, A153, or A767 as applicable.
 - a. Refer to Section 01 4000 "Quality Requirements".

1.7 COORDINATION

- A. Coordination between Fabricator and Galvanizer: Prior to fabrication, fabricators shall submit approved fabrication shop drawings to the galvanizer. The Galvanizer shall review fabricator's shop drawings for suitability of materials for galvanizing and coatings and coordinate and required fabrication modifications.

1.8 QUALITY ASSURANCE

- A. Coating Applicator: Company that specializes in hot-dip galvanizing after fabrication and follows the procedures of the Quality Assurance Manual of the American Galvanizers Association.
- B. Pre-construction Conference for Metal Fabrications: Contractor shall schedule a meeting to be attended by Contractor, Owner, Architect, Fabricator and Galvanizer. Topics to be addressed include project schedule, scope of metal fabrications, coordination between fabricator and galvanizer, finish of surfaces, applications of coatings, submittals and approvals.
- C. Materials:
1. For steel to be hot-dip galvanized, provide steel chemically suitable for metal coatings complying with the following requirements:
 - a. Carbon below: **0.25 percent**
 - b. Phosphorous below: **0.04 percent**
 - c. Manganese below: **1.3 percent**
 - d. Silicon below: **0.04 percent.**
 - e. Notify the galvanizer if steel does not meet these requirements so that suitability for galvanizing may be determined and whether special processing techniques are required.
- D. Alternate coatings not acceptable:
1. G40e

1.9 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Galvanized Products:
1. Stack and bundle during transport and store to allow air flow between galvanized surfaces.
 2. Load for transport to permit continuous drainage should wetting occur.
 3. Do not rest galvanized products on cinders or clinkers.
 4. Handle all articles to be galvanized in such a manner as to avoid mechanical damage and to minimize distortion.

GALVANIZED FINISHES ON STEEL

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 STEEL MATERIALS

- A. General: Material for galvanizing shall be geometrically suitable for galvanizing as described in ASTM A384 and A385. Steel materials suitable for galvanizing include structural shapes, pipe, sheet, fabrications and assemblies.
1. Material shall be chemically suitable for galvanizing. Comply with AGA criteria and recommendations for determining suitability of steel for galvanizing.
 2. Advise galvanizer of chemical properties of steel in advance so that determination can be made whether material can be galvanized and whether or not special processing techniques shall be performed.
- B. Recommended steel materials for hot-dip galvanizing include but are not limited to:
1. Structural shapes and plates: ASTM A36, A242 type 2, A283, A441, A500, A501, A529, A572 and A588.
 2. Steel for fasteners:

General Category	Bolt Material	Nut Material
Carbon Steel	A307 GR A or B	A563 Gr A
High Strength	A325 Type 1	A563 Gr DH
Tower Bolts	A394	A563 Gr A
Quenched and Tempered (Carbon Steel Bolts)	A449	A563 Gr C
Quenched and Tempered (Alloy Steel Bolts)	A354 Gr BC	A563 Gr DH

3. Steel for sheet metal articles: ASTM A569 or A570.
4. Steel for pipe or tubing: ASTM A53, A120 or A595 Gr A or B.

NOTE: Avoid use of steel with an ultimate tensile strength greater than 150 ksi because these steels have been shown to have a potential for hydrogen embrittlement due to pickling prior to galvanizing.

2.3 FABRICATION REQUIREMENTS

- A. Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's Recommended Details for Galvanized Structures.
- B. Fabrication practices for Products shall be in accordance with the applicable portions of ASTM A143, A384, and A385, except as specified herein. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
- C. Fabricator shall consult with Architect and hot-dip galvanizer regarding potential problems or potential handling problems during the galvanizing process that may require modification of design before fabrication proceeds.
- D. Whenever possible, bolted connections and slip joints shall be used to minimize field welding of material.

2.4 PRODUCT PREPARATION

- A. Preparation for galvanizing:
 - 1. Remove all welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing.
 - 2. Provide holes and lifting lugs as necessary for handling during galvanizing process and only at positions approved by Architect.
 - 3. Remove grease, oil, paint and other deleterious materials.
 - 4. Do not use unsuitable marking paints on steel prior to galvanizing.
 - a. Consult with the galvanizer about removal of grease, oil paint and other deleterious material prior to fabrication.
 - 5. Remove by blast cleaning, or other method as necessary if surface contaminants and coatings cannot be removed by normal chemical cleaning process.
- B. Surface Preparation:
 - 1. Pre-clean using caustic bath, acid pickle and flux.
 - 2. Alternatively, pre-clean by blast cleaning and fluxing.
 - 3. Conform to ASTM A123 and ASTM A386, as applicable, for steel members, fabrications and assemblies.
 - 4. Conform to ASTM A153 for bolts, nuts and washers, and steel hardware components.
 - 5. Conform to ASTM A143 for protection against embrittlement.

2.5 GALVANIZING

- A. Galvanizing, General:
 - 1. Ferrous metal fabrications shall be galvanized only as specified or noted on the Drawings.
 - 2. Where galvanized finish is specified or noted, ferrous fabrications shall be galvanized in accordance with applicable referenced ASTM standards after fabrication.
 - 3. Galvanizing shall be by hot dip method only unless otherwise specified.
 - 4. Galvanize steel members, fabrications and assemblies after fabrication by the hot-dip process in accordance with ASTM A123.

GALVANIZED FINISHES ON STEEL

1. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with ASTM A153.
 2. Safeguard products against steel embrittlement in conformance with ASTM A143.
 3. Galvanize reinforcing steel in accordance with ASTM A767.
- A. Portions Not to Receive Galvanizing: Protect portions of parts to be embedded in concrete from galvanizing, except galvanize anchors and sleeves built into concrete and masonry.
 - B. Galvanizing Bath: Use not less than 98.0 percent zinc.
 - C. Coating Weight: Conform with paragraph 5.1 of ASTM A123, Table 1 of A767, or Table 1 of ASTM A153, as appropriate.
 - D. Coating Surface Finish: Wipe down surfaces after dip to remove pin holes, scale, drips, runs and points. Finish shall be continuous, adherent, smooth and evenly distributed, free from defects detrimental to intended end use and finishing of coated product.
 - E. Coating Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

2.6 REPAIR PRODUCTS

- A. General:
 1. Cold-Galvanizing Compound: Organic zinc-rich coating matching the aesthetic appearance of hot-dip galvanizing, containing at least 65 percent metallic zinc by weight in the dry film unless noted otherwise, complying with performance requirements of ASTM A780, DOD-P-21035B (Paint, High Zinc Dust Content, Galvanizing Repair) and SSPC PS-12, PS-12.01, PS-20, PS-22, PS-29 and PS-30.
- B. Zinc Repair Solder: For hot zinc galvanizing repair.
 1. Basis of Design: Teck Cominco Metals, Ltd., Mississauga, Ontario, Canada www.teck.com 905-822-2022.
 2. Zinc repair solder: Galva-Guard as manufactured by Teck Cominco Metals, Ltd., 3/16-inch diameter wire in coil or stick form, or equivalent meeting requirements.
 3. Product characteristics:
 - a. Nominal composition: 50 percent Zn, 49 percent Sn, 1 percent Cu.
 - b. Working temperature range: 390 degrees F to 480 degrees F (200 degrees C to 250 degrees C).
 - c. Corrosion resistant.
 - d. High-abrasion resistance.
 - e. Good adhesion to steel substrate.
 - f. Readily-controlled coating thickness.
 - g. Surface appearance matches hot-dipped galvanized.
 - h. Non-toxic.
- C. Galvanizing Repair Primer: (Field top coated)
 1. Application: Where galvanizing is damaged, repair surface with one coat of Galvanizing Repair Paint.
 - a. For site touch up only.

2. Product: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints and coatings specified to be used over it.
 - a. Material:
 - 1) Primer:
 - a) Refer to Section 09 9600 "High-Performance Coatings"
 - 2) Intermediate Coat: Refer to Section 09 9600 "High-Performance Coatings"
 - 3) Top Coat: Refer to Section 09 9600 "High-Performance Coatings"
 - b. VOC Content:
 - 1) All paints and coatings within the vapor barrier must meet the VOC levels listed in pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
 - a) Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions:
 - c. Surface Preparation:
 - 1) Typical. UNO: SSPC-SP3 Power tool Cleaning
 - 2) Exterior exposed steel: SSPC-SP6 Commercial Blast Cleaning typical.
 - 3) Interior exposed steel, except Parking Garage levels: SSPC-SP6 Commercial Blast Cleaning.
 - d. Application: Follow coatings manufacturer's printed instructions
 - e. Number of coats: One
 - f. Dry Film Thickness: Per manufacturers recommendations
 - g. Volume solids: 62 percent minimum
 - h. Standards: ASTM A780
 - i. Generic Class: Organic Zinc-Rich Urethane, single component.
 - j. Coating performance:
 - 1) ASTM B 117 Salt Spray (Fog) Testing: 30,000 Hours passed
 - 2) ASTM G 85 Prohesion testing: 15,000 Hours passed
- D. Galvanizing Repair Paint: (Left exposed) (DTR – 07.31.13 – need to update with Master)
 1. Application: Where galvanizing is damaged, repair surface with one coat of Galvanizing Repair Paint.
 - a. For site touch up only.
 2. Product: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints and coatings specified to be used over it.
 - a. Material:
 - 1) Paint:
 - a) Type B Tnemec Series 94-H2O Hydro-Zinc Primer x standard grey color
 - b) Type B, Tnemec 27WB x standard grey color
 - c) or equivalent meeting requirements or equivalent meeting requirements
 - b. VOC Content:
 - 1) All paints and coatings within the vapor barrier must meet the VOC levels listed in pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.

a) Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions:

c. Surface Preparation:

- 1) Typical. UNO: SSPC-SP3 Power tool Cleaning
- 2) Exterior exposed steel: SSPC-SP6 Commercial Blast Cleaning typical.
- 3) Interior exposed steel, except Parking Garage levels: SSPC-SP6 Commercial Blast Cleaning.

d. Application: Follow coatings manufacturer's printed instructions

e. Number of coats: One

f. Dry Film Thickness: Per manufacturers recommendations

g. Volume solids: **62 percent** minimum

h. Standards: ASTM A780

i. Generic Class: Organic Zinc-Rich Urethane, single component.

j. Coating performance:

- 1) ASTM B 117 Salt Spray (Fog) Testing: 30,000 Hours passed
- 2) ASTM G 85 Prohesion testing: 15,000 Hours passed

E. Primer: (Interior)

1. Application: A "shop or field" compliant rust inhibitive primer/finish for painting of ferrous metal, structural and miscellaneous steel for interior dry exposure. Also suitable over galvanized steel and organic zinc-rich coatings in wet exposures. A water-borne equivalent to "Standard Alkyd Shop Primer". Provide primers that are compatible with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."
2. Material: **Type A** Tnemec Series 115 Uni-Bond DF Primer or equivalent meeting requirements
3. Surface Preparation:
 - a. SP3 Power Tool Cleaning.
 - b. Where jobsite exposure is expected to exceed 6 months, SSPC-SP6 Commercial Blast Cleaning is required.
 - c. For cleaning galvanized steel: Clean per ASTM D 6386 in compliance with Section 5.4.1 Sweep Blasting.
4. Number of coats: One
5. Dry Film Thickness: **2.0 mils to 4.0 mils** DFT
6. Volume Solids: **44 percent**
 - a. VOC Content:
 - 1) All paints and coatings within the vapor barrier must meet the VOC levels listed in pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
 - a) Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions.
7. HAP's: 0 lbs./gallon
8. Generic Class: Self-Crosslinking Hydrophobic Acrylic
9. Coating Performance:
 - a. ASTM D 4585 Water Resistance 1,992 hours passed
 - b. ASTM D 1654 Corrosive Environments 1,992 hours passed.
10. Substitutions: 01 2500 "Substitution Procedures".

2.07 SOURCE QUALITY CONTROL

- A. Inspection and Testing: Comply with requirements specified in Section 01 4000 "Quality Requirements".
 - 1. Include visual examination and tests in compliance with ASTM A123, A767 or A153 as applicable to determine the thickness of the zinc coating on the metal surface.
 - 2. Inspection and testing of hot-dip galvanized coatings shall be performed in accordance to guidelines per AGA, Inspection of Hot-Dip Galvanized Steel Products.
 - 3. Furnish Certificate of Compliance with ASTM Standards and Specifications herein listed.
 - 1) Certificate shall be signed by galvanizer and contain detailed description of material processed.
 - 2) Certificate shall include information as to the ASTM standard used for the coating.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Pre-clean steel work in accordance with accepted methods to produce an acceptable surface for quality hot-dip galvanizing.

3.2 COATING APPLICATION

- A. Galvanize steel members, fabrications and assemblies after fabrication by hot-dip process in accordance with ASTM A123 / 123M
- B. Galvanize bolts, nuts, washers and iron and steel hardware components in accordance with ASTM A153 / 153M.
- C. Safeguard products against steel embrittlement in conformance with ASTM A143.
- D. Galvanize reinforcing steel in accordance with ASTM A767.
- E. Handle all articles to be galvanized in such as a manner as to avoid and mechanical damage to minimize distortion.

3.3 COATING REQUIREMENTS

- A. Conform to paragraph 6.1 of ASTM A123 / 123M, Table 1 of ASTM A153 / 153M, or Table 2 of ASTM A767, as appropriate.
- B. Surface Finish:
 - 1. Continuous, adherent, as smooth and evenly distributed as possible and free from ant defects detrimental to the stated end use of the coated article.
 - 2. Surface shall be free of burrs and any other irregularities that would not be smooth to the touch.

- C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.4 TESTS

- A. Inspection and testing of hot-dip galvanized coatings shall be done under the guidelines provided in the AGA publication, 'Inspection of Products Hot-Dip Galvanized After Fabrication'.
- B. Include visual examination and tests in accordance with ASTM A123 / 123M, A153 / 153M, or A 767, as applicable, to determine the thickness of the zinc coating on the metal surface.
- C. Furnish Certificate of Compliance with the ASTM standards and specifications herein listed.
1. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed.
 2. The Certificate shall include information as to the ASTM standard used for the coating.

3.5 CONTINUOUS, AFIELD REPAIRS OF DAMAGED GALVANIZED COATING

- A. The maximum area to be repaired is defined in accordance with ASTM A123 / 123M, Section 6.2, current edition.
1. The maximum area to be repaired in the field must be approved by Owner and Architect prior to repair work.
- B. Field Repairs of Damaged Galvanized Coating: Repair areas damaged by welding, cutting, bolting and abrasion.
1. Use zinc-based solder coating where steel product is intended to remain unpainted. Use cold-galvanizing compound where steel product is intended to be field primed and finish coated (painted). If intention is not clear, provide zinc-based solder coating.
 2. Maximum area to be repaired shall be defined in accordance with ASTM A123 Section 4.6 current edition, as determined in advance of field repairs by mutual agreement between Architect and Contractor.
 3. Repair damage in accordance with manufacturer's instructions and recommendations and ASTM A780.
 4. Minimum thickness requirements for the repair shall be those described in ASTM A123 section 4.6 current edition or in ASTM A780.

- C. Hot Zinc Galvanizing Repair: Comply with manufacturer's instructions and recommendations and ASTM A780.
1. Clean surface and apply flux.
 2. Heat steel with torch to application temperature, which is above melting point of repair solder.
 3. Tin surface by rubbing with solder stick after which melt more solder and spread evenly over surface.
 4. Apply thick, uniform layer of solder.
 5. Remove flux residue with wet cloth.
 6. Coordinate surface preparation with applied finish paints and coatings, if applicable.
- D. Cold-Galvanizing Compound Galvanizing Repair: Prepare substrate and apply cold-galvanizing compound in compliance with manufacturer's instructions and recommendations. Comply also with ASTM A780. Coordinate curing time and compatibility with applied finish paints and coatings, if applicable.

- END OF SECTION -

- SECTION 05 0900 -**ANCHORS AND FASTENERS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- B. Principal work in this sections includes:
 - 1. Anchors and fasteners for connection to concrete and steel construction.
 - 2. General requirements for welding of steel products.
 - 3. Shrinkage-resistant grout and grouting of structural framing base plates, equipment anchors and miscellaneous metal fabrications.

1.2 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 05 0810 "Galvanized Finishes for Steel" for galvanized finishes, and repair priming and painting of damaged galvanized finishes.
- D. Section 05 1200 "Structural Steel Framing".
- E. Section 05 5000 "Metal Fabrications" for fabrications to be fastened, welded and grouted.
- F. Section 05 5213 "Pipe and Tube Railings" for posts to be grouted at ramp and stair handrails and guardrails.
- G. Section 07 6200 "Sheet Metal Flashing and Trim" for fabrications from sheet metal, for weather protection.
- H. Section 09 9123 "Interior Painting" for field priming requirements, applicable to areas damaged during welding and other anchoring and fastening operations.
- I. Section 09 9123.13 "Interior Paint Schedule".

- J. Section 09 9600 "High-Performance Coatings" for field priming requirements, applicable to areas damaged during welding and other anchoring and fastening operations.
- K. Section 10 7316 "Custom Steel Canopies"
- L. Section 10 7318 "Glass and Glass Covered Canopies"
- M. Section 10 8213 "Exterior Screened Enclosures" for roof top mechanical screens.
- N. Divisions 22 and 23 - Mechanical: Equipment and other mechanical and plumbing components to be fastened, welded and grouted.
- O. Division 26 - Electrical: Equipment, fixtures and other electrical components to be fastened, welded and grouted.

1.3 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Welding Society (AWS):
 - 1. AWS 01.1 - Structural Welding Code--Steel.
 - 2. AWS 01.2 - Structural Welding Code--Aluminum.
 - 3. AWS 01.3 - Structural Welding Code--Sheet Steel.

1.1 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Submit catalog data for all standard production products.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.4 QUALITY ASSURANCE

- A. Inspection: Testing Agency will provide special inspection during all field welding, and high-strength bolt installations and tightening operations, expansion bolt installations and installations of epoxy-type anchors in concrete, in accordance with Phoenix Building Construction Code and in accordance with requirements specified in Section 01 4000 "Quality Requirements".
 - 1. Minimum qualifications of qualified welding inspector shall be those required for AWS Certified Welding Inspector (CWS), as defined in provisions of AWS QCI - Standard Guide for Qualifications and Certification of Welding Inspectors, published by American Welding Society.

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- B. Welder Qualifications: Welders shall be qualified by tests as prescribed in AWS Standard Qualification Procedure, B3.0-41, to perform the type of welding required.
- C. Field-Verified Dimensions: Prior to fabrication, field verify dimensions and details of construction. Immediately report variances in writing to Architect.

1.2 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.5 PROJECT CONDITIONS

- A. Field Inspection of Fabricated Products: Prior to installation, inspect products for damage and verify markings and dimensions against reviewed submittals.
- B. Environmental Conditions: Do not install products intended for interior locations when spaces are uncovered and unprotected from inclement weather.
- C. Coordination: Coordinate metal fabrications Work with Work specified in other Sections so that related Work shall be accurately and properly joined.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.1 ANCHORS, FASTENERS AND ACCESSORY MATERIALS

- C. Anchors and Fasteners, General: Same material, color and finish as the metal to which applied, unless otherwise indicated.
- D. Exterior Exposure: Provide stainless steel.
- E. Type, Size and Spacing: Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate.
- F. Screw Head, Typical: Unless otherwise noted, exposed screws shall be phillips oval or flat head, countersunk.
- G. Standard Bolts and Nuts, Steel: ASTM A307, Grade A, hexagonal head.
- H. High-Strength Threaded Fasteners:
 - 1. Heavy hex structural bolts: ASTM A325, Type 1, Supplementary Requirements S.1, with threads included in shear plane and marked "A325 T," unless otherwise noted on Drawings.
 - a. Conform to the provisions of AISC 360.

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- b. Manufacture with identifying mark placed on top of the head.
- 2. Washers:
 - a. Hardened Type: ASTM F436, Type 1, style as required.
 - b. Direct Tension Load Indicating Type: ASTM F959 Type 325 or Type 490.
- 3. Nuts: ASTM A563, Heavy Hex, Grade C, plain (non-zinc coated).
- 4. Option: At Contractor's option the following bolts may be used with standard washers instead of direct tension load indicating type, where required:
 - a. Tension Control Bolts, manufactured by Lejeune Bolt Company or Bristol Machine Company.
- I. Threaded Rod: For threaded stud anchors, all-thread rod complying with ASTM A36.
- J. Lag Screws and Bolts, Steel: ANSI B18.2.1, type and grade best suited for the purpose, hexagonal or square head.
- K. Plain Steel Screws: FS FF-S-85, FS FF-S-92 and FS FF-S-111; type and grade best suited for the purpose.
- L. Stainless Steel Screws: AISI 300 Series.
- M. Self-Drilling Metal Fasteners: TEKS by ITW Buildex, Itasca, IL. www.itwbuildex.com
800-BUILDEX
- N. Plain Steel Washers: FS FF-W-92, round, carbon steel.
- O. Lock Washers: FS FF-W-84, helical spring, carbon steel.
- P. Toggle Bolts: Not permitted. Depending upon substrate, use expansion anchor or screw into appropriate backing material.
- Q. Concrete Anchors, Epoxy Adhesive Type: Manufacturer, product, type and size as identified on Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01 6000 - Product Requirements.
- R. Concrete and Masonry Anchors, Wedge-Type: Manufacturer, product, type and size as identified on Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01 6000 - Product Requirements.
- S. Concrete and Masonry Anchors, Self-Threading: Manufacturer, product, type and size as identified on Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01 6000 - Product Requirements.
- T. Fiber Plugs and Screws: Not permitted.
- U. Lead Expansion Shields: Not Permitted.
- V. Powder-Actuated Driven Fasteners: Comply with notes on Drawings and the following.
 - 1. Use only if acceptable to Architect, generally not permitted where not specifically indicated or in load-bearing installations; Fed Spec FF-P-395 or Fed Spec GGG-D- 777;

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as produced by ITW Ramset, Glendale Heights, IL www.ramset.com 800-726-7386 in compliance with ICC Evaluation Service, Inc. (ICC ES) Report ESR-2690.

2. Equivalent products by Hilti Corporation, Tulsa, OK www.us.hilti.com 866-445-8827, will be acceptable in accordance with the "or equal" provision specified in Section 01 6000 - Product Requirements.

- W. Welding Rods and Bare Electrodes: As indicated on Drawings for welding of structural (load-bearing) members. If not indicated, select rods and electrodes in accordance with AWS D1.1 - Code for Welding in Building Construction, applicable to metal alloy to be welded.

2.2 GROUTING COMPOUNDS

- A. Specified Manufacturers: Products of the following manufacturers are specified and will be acceptable provided they comply with referenced standards all other requirements of the Contract Documents:

1. Dayton Superior Corporation www.daytonsuperior.com 800-745-3708.
2. Euclid Chemical Co., Cleveland, OH www.euclidchemical.com 800-321-7628.
3. L&M Construction Chemicals, Inc., Omaha, NE www.lmcc.com 800-362-3331
4. Master Builders products – BASF www.basf-admixtures.com 800-228-3318
5. W.R. Meadows, Inc., Elgin, IL www.wrmeadows.com 800-342-5976
6. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com 800-933-7452
7. Sonneborn/BASF www.buildingsystems.basf.com 800-228-3318

- B. Metallic Shrinkage-Resistant Grout: For filling under equipment and interior miscellaneous metal fabrications; pre-mixed factory-packaged compound, metallic aggregate, minimum 5000 psi 28-day compressive strength. Confirm product selection with manufacturer's recommendations for intended use.

1. Embeco 885 by Master Builder/BASF or equal.

- C. Non-Metallic Shrinkage-Resistant Grout: For filling around anchors for exterior miscellaneous metal fabrications; pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621, minimum 5000 psi 28-day compressive strength.

1. Sure Grip Grout by Dayton Superior.
2. N.S.Grout by Euclid Chemical Co.
3. Crystex by L&M Construction Chemicals, Inc.
4. Masterflow 713 Plus or Masterflow 928 by Master Builders/BASF

- D. Shrinkage-Resistant Setting Grout: For setting railing posts and similar components in sleeves or blockouts in concrete; pre-mixed, natural aggregate, minimum 5000 psi 28-day compressive strength, Master Builders Technology, Inc., Set Grout.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Preparation for Cutting and Fitting: Obtain Architect's review prior to site cutting or making

adjustments not indicated.

- B. Welding Preparation: Clean and strip site primed steel items to bare metal where site welding is indicated.
- C. Blocking and Bracing: Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Coordination with Cast in Place Concrete: Furnish setting templates and place items required to be cast into concrete, as specified in Section 03 2000 "Concrete Reinforcing".

3.2 INSTALLATION, TYPICAL

- A. Installation, General: Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Field Welding: Perform field welding in accordance with AWS D1.1.

3.3 BASES AND BEARING PLATES

- A. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - 4. For proprietary grout materials, comply with manufacturer's instructions.

3.4 FIELD CONNECTIONS

- A. Field Connections, General:
 - 1. Conceal connections where possible. Otherwise, make countersinks for concealment after fabrication, except where noted.
 - 2. Provide lugs, clips, anchors and miscellaneous fastenings necessary for complete assembly and installation.
 - 3. Fit or miter to hairline tolerances.
 - 4. Component parts of built-up members shall be well-pinned with closely-fitted contact.
- B. Coordination: Make provisions to connect metal fabrications with or to receive Work specified in other Sections.
- C. Joints Exposed to Weather or Water: Fabricate and secure joints to keep water out, or provide adequate drainage of water that penetrates.
- D. Installation and Testing of Expansion Anchors:

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1. Comply with anchor manufacturer's installation instructions and conditions of approval of authorities having jurisdiction, including applicable ICC Evaluation Service, Inc. (ICC ES) Research Report (NER).

3.5 ANCHORING POSTS AND RAILINGS

- A. Post Anchors Grouted in Concrete: Anchor posts by forming or core-drilling holes not less than **5 -inches (125 mm)** deep and **3/4 -inch (20 mm)** greater than outside diameter of post.
 1. Clean holes of all loose material, insert posts, and fill annular space between post and concrete with non-shrink grout, mixed and placed to comply with grout manufacturer's instructions and recommendations.
 2. Unless otherwise indicated, leave joint at post base exposed, wipe off surplus grout material and leave 1/8-inch (3-mm) build-up, sloped away from post.
- B. Posts and Railings Bolted to Substrate: Use fasteners as indicated or, if not indicated, sized to suit dead and live loads. Coordinate framing and backing installation at steel and wood framing to provide suitable supports.
 1. Where indicated, make connections to concrete and masonry substrates by bolting with expansion anchors.
 2. Where indicated, make connections to steel shapes by through-bolting.
 3. Where indicated, make connections to cold-formed steel stud or joist framing or sheet backing by screwing with sheet metal screws.
 4. Where indicated, make connections to wood substrates using lag bolts into wood framing or blocking.
 5. Where indicated, install removable railing and fence sections in slip-fit metal sockets embedded into concrete. Accurately locate sockets to match post spacing.
 6. Toggle bolts will not be acceptable.

3.6 FIELD WELDING

- A. Field Welding: Weld joints, corners and seams continuously in compliance with AWS D1.1 and the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
 5. Re-weld to fill holes. Putties and fillers will not be accepted.
 6. Do not field weld galvanized components to remain unfinished. Grind welds smooth and flush with base material.
- B. Welding Inspection and Testing: Inspect and test welds during installation of load-carrying components as follows:
 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record Work required and performed to correct deficiencies.
 2. Perform visual inspection of all welds.

3. Perform ultrasonic inspections of full penetration groove welds in compliance with ASTM E164.

3.7 CLEANING AND TOUCH-UP

- A. Cleaning: Perform initial cleaning immediately after completion of installation. Prepare surfaces for finish painting as specified in Section 09 99123 - Interior Painting, for interior locations, and Section 09 9600 – High-Performance Coatings, for exterior locations.
- B. Galvanizing Touch-Up: Touch up galvanizing immediately after installation, including after galvanizing is damaged due to field welding. Prepare surface and apply cold galvanizing compound in compliance with the manufacturer's instructions and recommendations. Refer to products and procedures specified in Section 05 0810 - Galvanized Finishes on Steel.
- C. Primer Paint Touch-Up: Immediately after erection or installation, touch up shop paint. Use products as specified in Section 09 9123 - Interior Painting, for interior locations, and as specified in Section 09 9600 – High-Performance Coatings, for exterior locations.
 1. Clean field welds, bolted joints, and areas where primer is damaged.
 2. Clean and primer paint welds and surrounding areas affected by welding.
 3. Paint with material used for shop painting, minimum 3 mils dry film thickness.

- END OF SECTION -

- SECTION 05 1200 -**STRUCTURAL STEEL FRAMING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural Steel

1.3 RELATED SECTIONS:

- A. Section 01 4500 "Quality Control"
- B. Section 03 3000 "Cast-in-Place Concrete"
- C. Section 05 3100 "Steel Decking"
- D. Section 05 4000 "Cold-Formed Metal Framing"
- E. Section 05 5000 "Metal Fabrications"
- F. Section 09 9123 "Interior Painting"
- G. Section 09 9123.13 "Paint Schedule"
- H. Section 09 9600 "High Performance Coatings"
- I. Section 10 7316 "Custom Steel Canopies"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by [AISC](#)'s "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.6 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product Data: Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.
- C. Product Data: For each type of product specified.
 - 1. Shop Drawings detailing fabrication of structural steel components.
 - a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - b. Indicate welds by standard [AWS](#) symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - c. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
 - d. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation.
 - 2. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
 - 3. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
 - a. Structural steel, including chemical and physical properties
 - b. Bolts, nuts, and washers, including mechanical properties and chemical analysis
 - c. Direct-tension indicators
 - d. Shear stud connectors
 - e. Shop primers
 - f. Nonshrink grout

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer with a minimum of five years experience, who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
 - 1. Fabricator must participate in the [AISC](#) Quality Certification Program and be designated an [AISC](#)-Certified Plant as follows:
 - a. Category: Category "Sbd", Conventional Steel Building Structures.

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- b. Fabricator shall be registered with and approved by authorities having jurisdiction.

C. Comply with applicable provisions of the following specifications and documents:

1. [American Institute of Steel Construction Inc. \(AISC\)](#) Publications:
 - a. "AISC Code of Standard Practice for Steel Buildings and Bridges."
 - b. "Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design."
 - c. "Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings."
 - d. "Specification for Allowable Stress Design of Single-Angle Members."
 - e. "Load and Resistance Factor Design Specification for Single-Angle Members."
 - f. "Seismic Provisions for Structural Steel Buildings."
2. [ASTM International](#) Publications:
 - a. A6 "Standard Specification for General Requirements for Rolled Steel Bars, Plates, Shapes, and Sheet Piling."
 - b. A27 "Standard Specification for Steel Castings, Carbon, for General Application"
 - c. A36 "Standard Specification for Carbon Structural Steel".
 - d. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
 - e. A108 "Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished"
 - f. A123 "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products"
 - g. A148 "Standard Specification for Steel Castings, High Strength, for Structural Purposes"
 - h. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
 - i. A325 "Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength"
 - j. A490 "Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength"
 - k. A500 "Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes"
 - l. A501 "Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing"
 - m. A572 "Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel"
 - n. A588 "Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4-in. [100-mm] Thick"
 - o. A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings"
 - p. B695 "Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel"
 - q. C1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)"
 - r. E119 "Standard Test Methods for Fire Tests of Building Construction and Materials"
 - s. E164 "Standard Practice for Ultrasonic Contact Examination of Weldments"

- t. E709 "Standard Guide for Magnetic Particle Examination
 - u. F959 "Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners"
- 3. [Research Council on Structural Connections \(RCSC\)](#) Publications:
 - a. "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
 - b. "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- D. Welding Standards: Comply with applicable provisions of [AWS](#) D1.1 "Structural Welding Code-Steel."
Present evidence that each welder has satisfactorily passed [AWS](#) qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Section 01 31 00 "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.9 SEQUENCING

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel Shapes, Plates, and Bars: As follows:
 - 1. Carbon Steel: [ASTM](#) A36.
 - 2. High-Strength, Low-Alloy Columbium-Vanadium Steel: [ASTM](#) A572, Grade 50.
 - 3. High-Strength, Low-Alloy Structural Steel: [ASTM](#) A588, Grade 50, corrosion resistant.
- B. Cold-Formed Structural Steel Tubing: [ASTM](#) A500, Grade B.

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- C. Hot-Formed Structural Steel Tubing: [ASTM](#) A501.
- D. Steel Pipe: [ASTM](#) A53, Type E or S, Grade B.
 - 1. Finish: Black, except where indicated to be galvanized.
 - 2. Carbon-Steel Castings: [ASTM](#) A27, Grade 65-35, medium-strength carbon steel.
- E. High-Strength Steel Castings: [ASTM](#) A148, Grade 80-50.
- F. Shear Connectors: [ASTM](#) A108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, [AWS](#) D1.1, Type B.
- G. Anchor Rods, Bolts, Nuts, and Washers: As follows:
 - 1. Unheaded Rods: [ASTM](#) A36.
 - 2. Headed Bolts: [ASTM](#) A325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 - 3. Headed Bolts: [ASTM](#) A490, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 - 4. Washers: [ASTM](#) A36.
- H. High-Strength Bolts, Nuts, and Washers: [ASTM](#) A325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers. Finish shall match material connected unless noted otherwise on plans.
 - 1. Finish: Hot-dip zinc-coating, [ASTM](#) A153, Class C.
 - 4. Direct-Tension Indicators: [ASTM](#) F959, Type 325.
 - a. Finish: Mechanically deposited zinc-coating, [ASTM](#) B695, Class 50.
- I. High-Strength Bolts, Nuts, and Washers: [ASTM](#) A490, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.
 - 1. Direct-Tension Indicators: [ASTM](#) F959, Type 490, uncoated.
- J. Welding Electrodes: Comply with [AWS](#) requirements.

2.2 PRIMER

- A. Fabricator's standard, fast-curing, lead-free, universal primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure, complying with performance requirements of FS TT-P-664.
 - 1. Primer paint shall be compatible with finish coats on architecturally exposed steel.
 - a. [SSPC](#) Paint 25 BCS, Type II, iron oxide, zinc oxide, raw linseed oil and Alkyd or one coat of [SSPC](#) Paint 23, latex primer, as verified with top coat manufacturer.
 - b. Refer to Section 09 9600"
- B. Where prime painted steel is to receive sprayed-on fireproofing, the substrate shall provide adequate adhesion. Coordinate with fireproofing installer in selecting primer paint to be used to assure this requirement is met.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with [ASTM](#) C1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to [AISC](#) specifications referenced in this Section and in Shop Drawings.
 - 1. Camber structural steel members where indicated.
 - 2. Identify high-strength structural steel according to [ASTM](#) A6 and maintain markings until steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 - 5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
 - 6. Comply with fabrication tolerance limits of [AISC's](#) "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
 - 1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 - 2. Comply with fabrication requirements, including tolerance limits, of [AISC's](#) "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded.
- D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to [AWS](#) D1.1 and manufacturer's printed instructions.
- F. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.
- G. Welded Door Frames: Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.
- H. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

STRUCTURAL STEEL FRAMING

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.5 SHOP CONNECTIONS

- A. Shop install and tighten high-strength bolts according to [RCSC](#)'s "Specification for Structural Joints Using [ASTM](#) A325 or A490 Bolts."
 1. Bolts: [ASTM](#) A325 high-strength bolts, unless otherwise indicated.
 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
- B. Weld Connections: Comply with [AWS](#) D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds **1/2 -inch** and larger.
 - a. Grind flush butt welds.
 - b. Dress exposed welds.

2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of **2 -inches**.
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed-on fireproofing.
 5. Exterior Railings and surfaces within interior pool area to receive "high performance coatings" require special primers. See Section 09 9600.
 6. Galvanized surfaces.
- B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with [Society for Protective Coatings \(SSPC\)](#) Surface Preparation Guidelines as follows:
 1. All interior steel exposed to view: [SSPC](#)-SP 6/NACE No. 3, Commercial Blast Cleaning.
 2. All exterior steel exposed to weather: [SSPC](#)-SP 10/NACE No. 2, Near White Blast Cleaning.
 3. All other steel: [SSPC](#)-SP 3, Power Tool Cleaning.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by [SSPC](#) to provide a dry film thickness of not less than

2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

- D. Paint Systems: Review painting specifications for finish paint systems. Coordinate surface preparations of steel and type of primer used with specifications and the manufacturer's recommendations to insure compatibility.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to [ASTM](#) A123.

2.8 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.

- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

- D. Joints Using [ASTM](#) A325

- E. Shop-bolted connections will be tested and inspected according to [RCSC](#)'s "Load and Resistance Factor Design Specification for Structural Joints Using [ASTM](#) A325 or A490 Bolts."

- F. In addition to visual inspection of all welds, shop-welded full penetration welds will be inspected and tested according to [AWS](#) D1.1 and the inspection procedures listed below, at testing agency's option.

1. Liquid Penetrant Inspection: [ASTM](#) E165.
2. Magnetic Particle Inspection: [ASTM](#) E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Radiographic Inspection: [ASTM](#) E94 and [ASTM](#) E142; minimum quality level "2-2T."
4. Ultrasonic Inspection: [ASTM](#) E164.

- G. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of [AWS](#) D1.1 for stud welding and as follows:

1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of [AWS](#) D1.1.

STRUCTURAL STEEL FRAMING

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to [AISC](#) specifications referenced in this Section.
- B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - 4. Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of structural steel within [AISC's](#) "Code of Standard Practice for Steel Buildings and Bridges."
 - 1. Maintain erection tolerances of architecturally exposed structural steel within [AISC's](#) "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- E. Splice members only where indicated.

- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection unless approved by Engineer of Record.
- H. Finish sections thermally cut during erection equal to a sheared appearance.
- I. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. Install and tighten high-strength bolts according to [RCSC](#)'s "Specification for Structural Joints Using [ASTM](#) A325 or A490 Bolts."
 - 1. Bolts: [ASTM](#) A325 high-strength bolts, unless otherwise indicated.
 - 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
- B. Weld Connections: Comply with [AWS](#) D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Comply with [AISC](#) specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
 - Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Field-bolted connections will be tested and inspected according to [RCSC](#)'s "Specification for Structural Joints Using [ASTM](#) A325 or A490 Bolts."
 - 1. Direct-tension indicator gaps will be verified to comply with [ASTM](#) F959, Table 2.
- E. In addition to visual inspection of all welds, field-welded full penetration welds will be inspected and tested according to [AWS](#) D1.1 and the inspection procedures listed below, at testing agency's option.

STRUCTURAL STEEL FRAMING

1. Liquid Penetrant Inspection: ASTM E165.
2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T."
4. Ultrasonic Inspection: ASTM E164.

F. In addition to visual inspection, field-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

3.6 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Section 09 90 00 "Painting."

- END OF SECTION -

- SECTION 05 1213 -**ARCHITECTURALLY-EXPOSED STRUCTURAL
STEEL (AESS) FRAMING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Preparation and finishing of exposed stringers, treads, risers, pipes, shapes, and plates used in Interior Stair No. 5 in addition to other exposed fabrications specified in Division 05 Sections or designated on Contract Drawings as AESS.
 - 2. Preparation and finishing of exposed shapes, plates, and bars used in fascias, canopies, and trellises specified in Section 10 7316.
 - 3. Preparation and finishing of exposed shapes, plates, and bars used in exterior metal fabrications and other exposed fabrications specified in Division 05 Sections or designated on Contract Drawings as AESS.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 3300 "Submittal and Substitution Procedures".
- C. Section 01 4000 "Quality Requirements".
- D. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- E. Section 01 9113 "General Commissioning Requirements".
- F. Section 05 1200 "Structural Steel Framing".
- G. Section 05 5000 "Metal Fabrications".
- H. Section 05 5150 "Architectural Metal Stairs"
- I. Section 09 9123 "Interior Painting".

- J. Section 09 9123.13 "Interior Paint Schedule".
- K. Section 10 7316 "Custom Steel Canopies"
- L. Section 10 8213 "Exterior Screened Enclosures" for roof top mechanical screens.
- M. Section 09 9600 "High-Performance Coatings".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM International (ASTM):
 - 1. A36 - Specification for Carbon Structural Steel.
 - 2. A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. A500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 5. A501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 6. F436 - Specification for Hardened Steel Washers.
- C. American Institute of Steel Construction (AISC):
 - 1. Code of Standard Practice for Steel Buildings and Bridges.
 - a. Chapter 10.
- D. Specialty Steel Industry of North America (SSINA)
 - 1. No. 9 002 - Welding of Stainless Steels and Other Joining Methods.
- E. American National Standards Institute (ANSI):
 - 1. B18-22.1 - Plain Washers.
- F. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual.
- G. The Society for Protective Coatings (SSPC):
 - 1. Steel Structures Painting Manual (SSPC PA).
 - a. Volume 1 - Good Painting Practice.
 - b. Volume 2 - Systems and Specifications:
 - 1) SP-1 - Solvent Cleaning.
 - 2) SP-2 - Hand Tool Cleaning.
 - 3) SP-3 - Power Tool Cleaning.
 - 4) SP-6 - Commercial Blast Cleaning (NACE 3).
 - 5) SP-12 - Surface Preparation and Cleaning of Steel and Other Hard Materials by High and Ultra High-Pressure Water Jetting Prior to Recoating.

1.5 DEFINITIONS

- A. AESS: Structural steel designated as "Architecturally exposed structural steel" or "AESS" where indicated and/or noted in the Contract Documents or herein scheduled, structural steel members and accessories shall be considered Architecturally-Exposed Structural Steel and conform to the requirements for AESS.
- B. Category 1 AESS: AESS that is within **96 -inches (2400 mm)** vertically and **36 -inches (900 mm)** horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 1 architecturally exposed structural steel" or "AESS-1" in the Contract Documents.
 - 1. Exception is roof.
- C. Category 2 AESS: AESS that is within **20 -feet (6 m)** vertically and horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 2 architecturally exposed structural steel" or "AESS-2" in the Contract Documents.
 - 1. Exception is roof.
- D. Category 3 AESS: AESS that is not defined as Category 1 or Category 2 or that is designated as "Category 3 architecturally exposed structural steel" or "AESS-3" in the Contract Documents.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings: Show fabrication of AESS components.
 - 1. Submit Shop Drawings showing fabrication and installation, including plans, elevations, sections, details of components, and attachments to other units of work. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 3. Include embedment Drawings.
 - 4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
 - 5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation of bolt heads.
 - 6. Indicate exposed surfaces and edges and surface preparation being used.

7. Indicate special tolerances and erection requirements.

F. Samples: Submit Samples of AESS to set quality standards for exposed welds for Category 1 AESS.

1. Two steel plates, 3/8 -inches by 8 -inches by 4 -inches (9.5 by 200 by 100 mm), with long edges joined by a groove weld watertight and with weld ground smooth.
2. Steel plate, 3/8 -inches by 8 -inches by 8 -inches (9.5 by 200 by 200 mm), with one end of a short length of rectangular steel tube, 4 -inches by 6 -inches by 3/8 -inches (100 by 150 by 9.5 mm), welded to plate with a continuous fillet weld watertight and with weld ground smooth and blended.
3. Round steel tube or pipe, minimum 8 -inches (200 mm) in diameter, with end of another round steel tube or pipe, approximately 4 -inches (100 mm) in diameter, welded watertight to its side at a 45-degree angle with a continuous fillet weld and with weld ground smooth and blended.
4. Square or rectangular steel tube or pipe, minimum 12 -inches long by size of indicated HSS Tube steel framing, welded watertight at side to another tube side at a 90-degree angle with a continuous fillet weld and with weld ground smooth and blended.
5. Prepare components of same thickness and metal listed for final unit of work.
 - a. Samples for verification of each type and size of exposed fastener exhibiting metal type and finish.
6. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
7. Assembled sample of each system made from full-size partial length components. Show method of finishing members at intersections.
8. Stair tread and riser welded attachment to stringer.
9. Stair railing post attachment to stringer.

G. Closeout Submittals:

1. Submit under provisions of Section 01 7700 "Closeout Procedures".
2. Warranty: Submit specified warranty.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications:

1. A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
2. In accordance with the provisions of Section 01 4000 "Quality Requirements", submit qualification data to demonstrate capabilities and experience with projects of similar scope, complexity, and quality requirements. Include lists and photographs of completed projects with project names and addresses, names and addresses of the architects, owners, and other information specified.

- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint;
 - 1. Enclosed facilities: Endorsement P1
 - 2. Covered facilities: Endorsement P2
 - 3. Outside facilities: Endorsement P3 or
 - 4. SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.
 - 1. Build mockup of typical portion of AESS as shown on Drawings.
 - 2. Refer to Section 01 4339 "Mock-up Requirements" for mockup requirements.
 - 3. Coordinate painting requirements with;
 - a. Interior Conditions: Section 09 9123 "Interior Painting." For interior applications only.
 - 4. Coordinate high-performance coatings requirements with Section 09 9600 "High-Performance Coatings."
 - 5. Description / Schedule: Prior to installation, construct mockups for each system and finish required to verify selections made under sample submittals and to demonstrate appearance as well as execution. Mockups shall comply with the following requirements, using materials indicated for final units of work.
 - a. The mock up shall demonstrate weld quality, contouring of the welds at the aligned walls of the members. Provide one sample unpainted after surface preparation and one with the finish coat of paint.
 - b. Demonstrate the proposed range of aesthetic effects regarding each element listed under the fabrication article below.
 - c. Mockup shall have a finished surface including surface preparation and paint system.
 - d. Locate mockups on-site or in the fabricators shop as directed by the Architect. Mockups shall be full size pieces unless the Architect approves smaller models.
 - e. Notify Architect one week in advance of the dates and times when mockups will be constructed.
 - f. Obtain Architect's acceptance of mockups before start of final unit of work.
 - g. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
 - 1) Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed work.
 - 6. Provide the following mock-ups: One each, full size.
 - a. Refer to drawings.
 - b. Refer to specifications.
 - c. Interior: AESS supporting the Lobby stairs (exposed stringers & landing supports;
 - 1) Stair No. 5
 - 8. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- E. Field Samples: Construct field samples for each system and finish required to verify selections made under sample submittals and to demonstrate execution of aesthetic appearance. Field samples shall comply with the following requirements:
 - 1. Locate field samples as directed by Architect.
 - 2. Notify Architect one week in advance of the dates and times when field samples will be available for review.
 - 3. Obtain Architect's acceptance of field samples before start of remaining work.
 - 4. Maintain field samples during construction in an undisturbed condition as a standard for judging the completed work.
 - a. Accepted field samples in an undisturbed condition at the time of Substantial Completion may become part of the completed work.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them.
 - 1. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
 - 2. Refer to Section 09 9600 "High Performance Coatings"

1.10 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site or location agreed upon by Architect and Contractor .

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.12 FIELD CONDITIONS

- A. Field Measurements: Check actual dimensions of other construction by accurate field measurements before fabrication. Show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 DESIGN CRITERIA

- A. Design Requirements: Where structural steel or metal fabrications are designated as "AESS" on Contract Drawings or referenced in the Specifications, comply with fabrication requirements including tolerance limits of Section 10 of AISC Code of Standard Practice for structural steel identified as Architecturally-Exposed Structural Steel (AESS) regarding:
 - 1. Material and erection tolerances.
 - 2. Surface appearance and weld show-through.
 - 3. Welding and joint uniformity.
 - 4. Delivery of material.
 - 5. Deflection limitations.
- B. Comply with requirements of Sections 05 1200 and 05 5000 in conjunction with work of this Section.
 - 1. Finish: In general, AESS shall be finished in accordance with;
 - a. Comply with additional cleaning, preparation, and primer requirements of Section 09 9600, where applicable.
 - b. Shop preparation and shop primer shall be as specified herein.

2.3 ASSEMBLES

- A. Stair
 - 1. Location:
 - a. Ground floor: Jr. Ballroom Lobby
 - b. Second level: Foyer
 - 2. Stair:
 - a. No. 5
 - b. Adjacent stairs as indicated in drawings
 - 3. Components, including but not limited to; (Refer to drawings)
 - a. Steel stringers
 - b. Steel plate treads to receive applied tread finish materials.
 - c. Steel plate risers.
 - d. Attachment of glass infill railing posts
 - 1) Refer also to Section 05 5100 "Architectural Metal Stair and Railings"
 - e. Attachment of railing posts with integral lighting lamps
 - 1) Refer to drawings.

- 2) Refer also to Section 05 5100 "Architectural Metal Stair and Railings"

2.4 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Mechanically deposited zinc coating.
- B. Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 3, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
- C. Select fasteners of the type, grade, and class as shown on Contract Drawings required to produce connections in sizes that are capable of withstanding design loadings.
- D. Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

2.5 FILLER

- A. Filler: Polyester filler intended for use in repairing dents in automobile bodies.

2.6 PRIMER

- A. Primers:
 - 1. A "shop or field" compliant rust inhibitive primer/finish for painting of ferrous metal, structural and miscellaneous steel for interior dry exposure. Also suitable over galvanized steel and organic zinc-rich coatings in wet exposures. A water-borne equivalent to "Standard Alkyd Shop Primer".
 - a. Surface Preparation: SP3 Power Tool Cleaning. Where jobsite exposure is expected to exceed 6 months, SSPC-SP6 Commercial Blast Cleaning is required.
 - b. Material: Type A Tnemec Series 115 Uni-Bond DF
 - c. Number of coats: One
 - d. Dry Film Thickness: 2.0 to 4.0 mils DFT
 - e. Volume Solids: 44%
 - f. VOC's: 140 grams/liter
 - g. HAP's: 0 lbs./gallon
 - h. Generic Class: Self-Crosslinking Hydrophobic Acrylic
 - i. ASTM D 4585 Water Resistance 1,992 hours passed
 - j. ASTM D 1654 Corrosive Environments 1,992 hours passed.
 - k. Substitutions: Section 01 2500.

2. High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints and coatings specified to be used over it. For site touch up only.
 - a. Material: Type B Tnemec Series 94-H2O Hydro-Zinc Primer
 - b. VOC Content: Thinned 10% (No. 3 Thinner): 1.6 lbs/gallon, 194 grams/litre.
 - c. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning. For severe (immersion) exposure SSPC-SP 10 Near-White Blast Cleaning is required.
 - d. Application: Follow coatings manufacturer's printed instructions
 - e. Number of coats: One
 - f. Dry Film Thickness: 2.5 to 3.5 mils DFT
 - g. Volume solids: 62%
 - h. Generic Class: Organic Zinc-Rich Urethane, single component.
 - i. ASTM B 117 Salt Spray (Fog) Testing 30,000 Hours passed
 - j. Prohesion testing: ASTM G 85 15,000 Hours passed
 - k. Substitutions: Section 01 2500.

2.7 FABRICATION, (AESS)

- A. General: Fabricate Architecturally-Exposed Structural Steel (AESS) to comply with requirements indicated for design, dimensions, details, finish, and member sizes, but not less than that required to support structural loads.
 1. Locate field joints at concealed locations if possible.
 2. Detail assemblies to minimize handling and to expedite erection.
 3. Fabricate with exposed surfaces smooth, square, and free of surface blemishes, including pits, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
 4. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
 5. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
 6. Fabricate **Category 1** AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
 7. Fabricate **Category 1** AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.
 8. Grind sheared, punched, and flame-cut edges of **Category 1 and Category 2** AESS to remove burrs and provide smooth surfaces and edges.
 9. Fabricate **Category 1 and Category 2** AESS with exposed surfaces free of seams to maximum extent possible.
 10. Fabricate **Category 2 and Category 3** AESS to the tolerances specified in AISC 303 for steel that is not designated AESS.
 11. Seal-weld open ends of hollow structural sections with **3/8 -inch (9.5-mm)** closure plates for **Category 1, Category 2 and Category 3** AESS.
- B. Cutting:
 1. Straight cut-off of roll formed shapes shall be straight and true. Curved, beveled, filleted and shaped parts that are repeated shall be preformed on computer controlled equipment to ensure repetition between identical parts.
 2. Cut lines true and straight. Form radii true and concentric. Make transitions between straight and radius smooth and tangential to curve.
 3. Identical parts shall not exceed **1/16 -inch** distance, **1/16 -inch** radial variation, or 1-degree angular variation.

- a. Finished cuts shall have a smooth even surface comparable or better than surface quality with as-milled surfaces.
4. Ease exposed edges to a radius of approximately **1/16 -inch**, unless otherwise indicated.
- C. Assemble steel systems in shop to the greatest extent possible to minimize field splicing and assembly.
 1. Disassemble units only as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.
 2. Use connections that maintain structural value of joined pieces.
- D. Curved Members: Fabricate indicated members to curved shape by rolling to final shape in fabrication shop.
 1. Distortion of webs, stems, outstanding flanges, and legs of angles shall not be visible from a distance of **20 -feet (6 m)** under any lighting conditions.
 2. Tolerances for walls of hollow steel sections after rolling shall be approximately **1/2 -inch (13 mm)**.
 3. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - a. Form changes in direction of members by radius bends of radius indicated.
- E. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- F. Fabricate joints that will be exposed to weather in a watertight manner.
 1. Provide means to drain entrapped water in hollow sections of members that are exposed to the weather, to moisture from condensation, or to other sources or humidity.
 2. Exposed ends of members shall be welded closed with prefabricated end fittings.
- G. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of **1/8 -inch (3.2 mm)** with a tolerance of **1/32 -inch (0.8 mm)** for **Category 1, Category 2 and Category 3** AESS.
- H. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 1. Cut, drill, or punch holes perpendicular to steel surfaces.
 - a. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- J. Connections:
 1. General: Provide brackets, flanges, miscellaneous fittings, and anchors to connect members to other construction.
 - a. Provide inserts and other anchorage devices to connect systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding imposed loads. Coordinate anchorage devices with supporting structure.

2. Welded Connections: Shop fabricate systems for connecting members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
 - a. Use only metal inert gas welding. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
3. Non-welded Connections: Fabricate systems by connecting members as indicated on Drawings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

2.8 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened, Pretensioned and/or Slip critical.
 - a. Refer to drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:
 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
 2. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
 3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.
 4. Provide continuous welds of uniform size and profile where AESS is welded.
 5. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for **Category 1, Category 2 and Category 3** AESS.
 6. At locations where welding on the far side of an exposed connection of **Category 1, Category 2 and Category 3** AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
 7. Butt and Groove welds:
 - a. Grind butt and groove welds flush to adjacent surfaces within tolerance of **plus 1/16 -inch, minus zero inch (plus 1.5 mm, minus zero mm)** for **Category 1 and Category 2** AESS.
 - b. Make butt and groove welds flush to adjacent surfaces within tolerance of **plus 1/16 -inch, minus zero inch (plus 1.5 mm, minus zero mm)** for **Category 3** AESS. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
 8. Fillet welds:
 - a. Make fillet welds for **Category 1 and Category 2** AESS oversize and grind to uniform profile with smooth face and transition.
 - b. Make fillet welds for **Category 3** AESS of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
 - 2. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 3. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 - 4. Galvanize lintels and items designated as such in drawings attached to structural-steel frame and located in exterior walls.

2.10 SHOP FINISHES

- A. General:
 - 1. Cleaning:
 - a. Where indicated AESS in Drawings or as specified.
 - 1) Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Priming:
 - a. Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of **1.5 mils (0.038 mm)**. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - b. Spray apply primer coatings as specified herein.
 - 3. Comply with NAAMM Metal Finishes Manual for recommendations relative to applying and designating finishes.
 - 4. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples and one-half of the amount permitted for structural steel. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.
 - 5. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.
- B. Iron and Steel:
 - 1. Final finish coats shall be spray applied to primed surfaces in accordance with manufacturer's written instructions and Section 09 9600.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instruction, and directions for installing sleeves, concrete inserts, anchor bolts, and items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
 2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
- C. Coordinate setting drawings, diagrams, templates, instruction, and directions for installing sleeves, concrete inserts, anchor bolts, and items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Fit exposed connections accurately together to form tight, hairline joints,
- B. Perform cutting, drilling, and fitting required for installation. Set accurately in location, alignment, and elevation, as measured from established lines and levels.
 1. Do not weld, cut, or abrade surfaces of components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
- C. Erect pre-painted finish pieces using padded slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member's frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Architect during the pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Architect prior to erection.
 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. Materials: Meet requirements in Section 05 1200 "Structural Steel".

- E. Fabricate, set AESS assemblies and to elevations indicated and according to AESS 303 and AISC 360 to meet AISC Code of Standard Practice, Classification:
1. Erect **Category 1**; high profile conditions that are within reach to touch and can be viewed in close proximity to the tolerances specified in AISC 303 for steel.
 2. Erect **Category 2**; high profile conditions that are out of reach to touch and can be viewed in close proximity within 20 -feet to the tolerances specified in AISC 303 for steel.
 3. Erect **Category 3**; which are not Category 1 or 2 AESS to the tolerances specified in AISC 303 for steel.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Section 05 1200 "Structural Steel Framing." The testing agency is not responsible for enforcing requirements relating to aesthetic effect.
- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.
- C. The Architect shall observe the AESS steel in place and determine acceptability based on the mockup.
1. The Testing Agency shall have no responsibility for enforcing the requirements of this section.

3.5 REPAIRS AND PROTECTION

- A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.
- C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- D. Touchup Priming:
1. Cleaning and touchup priming are specified in Section 09 9123 "Interior Painting
 2. Cleaning and touchup priming are specified in Section 09 9600 "High-Performance Coatings."

3.6 ADJUSTING AND CLEANING

- A. Clean all metals by washing thoroughly with water and soap, followed by rinsing with clean water.
- B. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

3.7 PROTECTION

- A. Protect finishes from damage during construction period with temporary protective coverings approved by manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop. Make required alterations and refinish entire unit, or provide new units.

- END OF SECTION -

- SECTION 05 3100 -

STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Roof Deck
 - 2. Composite Floor Deck
 - 3. Ground level Lobby entrance Canopy

1.3 RELATED SECTIONS:

- A. Section 01 4500 "Quality Control"
- B. Section 03 3000 "Cast-In-Place Concrete"
- C. Section 05 4000 "Cold-Formed Metal Framing"
- D. Section 05 5000 "Metal Fabrications"
- E. Section 09 9123 "Interior Painting"
- F. Section 09 9123.13 "Paint Schedule"
- G. Section 09 9600 "High Performance Coatings"
- H. Section 10 7316 "Custom Steel Canopies"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product Data: Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.
- C. Product Data: For each type of product specified.
 - 1. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
 - 2. Welding Certificates: Copies of certificates for welding procedures and personnel.
 - 3. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
 - a. Mechanical fasteners.
 - 4. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- D. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer with a minimum of five years of experience who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to [ASTM E329](#) to conduct the testing indicated, as documented according to [ASTM E548](#).
- C. Welding: Qualify procedures and personnel according to [AWS D1.1](#), "Structural Welding Code - Steel," and [AWS D1.3](#), "Structural Welding Code - Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per [ASTM E119](#) by a testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- F. FMG Listing: Provide steel roof deck evaluated by [FMG](#) and listed in [FMG's](#) "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

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- G. Comply with applicable provisions of the following specifications and documents:
1. [American Iron and Steel Institute \(AISI\)](#) Publications:
 - a. Calculate structural characteristics of steel deck according to:
 - 1) SG02 "North American Specification for the Design of Cold-Formed Steel Structural Members".
 2. [ASTM International](#) Publications:
 - a. A108 "Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished"
 - b. A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process"
 - c. A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings"
 - d. A1008 "Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
 - e. E119 "Standard Test Methods for Fire Tests of Building Construction and Materials"
 - f. E329 "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction"
 3. [American Welding Society \(AWS\)](#) Publications:
 - a. D1.1 "Structural Welding Code - Steel"
 - b. D1.3 "Structural Welding Code - Sheet Steel"
 4. [Steel Deck Institute \(SDI\)](#) Publications:
 - a. No. 30 "Design Manual for Composite Decks, Form Decks and Roof Decks"

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers.
1. None
- B. Approved Manufacturers:
1. Steel Deck:
 - a. [Consolidated Systems, Inc. \(CSi\)](#) Metal Dek Group (800-654-1912)
 - b. [Epic Metals Corporation](#) (877-696-3742)
 - c. [Nucor, Vulcraft Group](#) (843-662-0381)
 - d. [Roof Deck, Inc.](#) (800-631-0057)
 - e. [United Steel Deck, Inc.](#), a subsidiary of Bouras Industries Inc. (800-631-1215)
 - f. [Verco Manufacturing Co.](#) (602-272-1347)
 - g. [Wheeling Corrugating Co.](#); Div. of Wheeling-Pittsburgh Steel Corp. (877-333-0900)

- h. [Infinity Structures Inc.](#) (678-513-4080)
- i. Approved substitution.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply the [Steel Deck Institute's "SDI Specifications and Commentary for Composite Steel Floor Deck,"](#) in [SDI](#) Publication No. 29, and the following:
 - 1. Galvanized and Shop-Primed Steel Sheet: [ASTM](#) A653, Structural Steel (SS), Grade , G60 (Z180) zinc coating; cleaned, pretreated, and shop primed with gray or white baked-on, rust-inhibitive primer.
 - 2. Deck Profile, Gauge and Depth: As noted on structural drawings.

2.3 COMPOSITE FLOOR DECK

- A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with the [Steel Deck Institute's "SDI Specifications and Commentary for Composite Steel Floor Deck,"](#) in [SDI](#) Publication No. 30, the minimum section properties indicated, and the following:
 - 1. Galvanized Steel Sheet: [ASTM](#) A653, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 3. Profile Depth and Gauge: As noted on Drawings.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Rib Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile [\[indicated\]](#) [\[recommended by SDI Publication No. 30 for overhang and slab depth\]](#).
- H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- I. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

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- J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and [\[level\]](#) [\[sloped\]](#) recessed pans of 1-1/2- inch minimum depth. For drains, cut holes in the field.
- K. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- L. Galvanizing Repair Paint: [SSPC](#) -Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- M. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION - GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in [SDI](#) Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate decking bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. Comply with [AWS](#) requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 INSTALLATION - ROOF DECK

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, spaced as indicated on the Drawings:
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals shown on the structural drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of **2 - inches**, with end joints lapped **2 -inch** minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than **12 -inches** apart with at least 1 weld at each corner.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 INSTALLATION - FLOOR DECK

- A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter and spacing **as indicated on the Drawings**.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, **as indicated on the Drawings**.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of **2 -inches** with end joints butted.
- D. Shear Connectors: Weld shear connectors through deck to supporting frame according to **AWS** D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors.
- E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to **SDI** recommendations, unless otherwise indicated.
- F. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to **SDI** recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.
- G. Install piercing hanger tabs not more than **14 -inches** apart in both directions, within **9 -inches** of walls at ends, and not more than **12 -inches** from walls at sides, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report test results promptly and in writing to Contractor and Owner's Representative and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to [ASTM](#) A780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Section.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

- END OF SECTION -

- SECTION 05 4000 -**COLD-FORMED METAL FRAMING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Delegated Design.
 - 2. Load-bearing wall framing.
 - 3. Exterior non-load-bearing wall framing.
 - 4. Soffit framing.
 - 5. Ceiling joist framing.
 - 6. Floor joist framing.
 - 7. Roof rafter framing.

1.3 RELATED REQUIREMENTS:

- A. Section 01 4553 "Facade Mockup Testing".
- B. Section 01 8316 "Exterior Enclosure Performance Requirements".
- C. Section 05 5000 "Metal Fabrications" for masonry shelf angles and connections.
- D. Pertinent sections specifying exterior cladding assemblies installed over cold formed metal framing.
- E. Section 09 2116 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
- F. Section 09 2216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.4 REFERENCED STANDARDS

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. SSMA – Steel Stud Manufacturer Association
- C. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- D. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- E. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- F. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- G. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- H. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- I. AISI - Standard for Cold-Formed Steel Framing General Provisions.
- J. AISI - Specification for the Design of Cold-Formed Steel Structural Members.
- K. AWS D.1.3 - Structural Welding Code - Sheet Steel.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site after approval of all submittals.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory. Demonstrate compliance with specified attributes.
- B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer and bearing his seal and signature, detailing fabrication and assembly of cold formed metal framed wall systems.
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 3. Include details of provisions for system expansion and contraction and for attachment and support of exterior cladding specified in related sections.

- C. Delegated-Design Submittal: For cold-formed steel framing.
 - 1. Structural Calculations: Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation, registered to practice in jurisdiction where Project is located, demonstrating compliance with referenced code and specified criteria.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Design Engineer, Installer and testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 - 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

1.10 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Design Loads and Performance Criteria: As specified in Section 01 8316 and as follows below.
- B. Deflection: Horizontal deflection (perpendicular to vertical members) shall not exceed $L/360$ and less as indicated.
- C. Design criteria: For additional structural design criteria see structural drawings and Section 01 8316 . For architectural design criteria and design intent refer to architectural drawings.
- D. Graphic representations of cold formed framing shown in the contract documents are to represent design intent only. Contractor shall develop and document on shop drawings a constructible, code-compliant design meeting design criteria established in contract documents.
- E. Contractor's design documented in approved shop drawings shall perform and coordinate with adjoining building systems and components while meeting design criteria established in contract documents.
- F. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
 - 1. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of **120 deg F** (**67 deg C**).

COLD-FORMED METAL FRAMING

2. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of **3/4 -inch (19 mm)**.
 3. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- G. Cold-Formed Steel Framing Design Standards:
1. Wall Studs: AISI S211.
 2. Headers: AISI S212.
 3. Lateral Design: AISI S213.
- H. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- I. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- J. Structural Performance: Design metal framing supporting EIFS, anchorage and related components to resist the following design wind loads.
1. Minimum wind design pressure shall be as required for wind tunnel requirements but not less than calculated using methods in referenced building code.
 2. Design corners for simultaneous positive inward pressure on both surfaces and simultaneous negative outward pressure on both surfaces.
 - a. Consider partial loading on one surface.
 3. Design metal members supporting EIFS to meet the:
 - a. Net deflection of steel framing members, perpendicular to the plane of the wall: 1/240 times span, or 1/2 inch (12 mm), whichever is less.
 - 1) Span is defined as the distance between anchor centerlines.
 - 2) For cantilevers, span is defined as two times the distance between anchor centerline and end of cantilever.
 - b. Framing member deflection where a sealant joint occurs between a framing member and a relatively stiff building element: 1/2 of the nominal joint width, maximum.
 - c. Where a framing member runs continuously past a deflecting support, the support deflection shall be considered in the analysis.
 - d. Connection points of framing members to anchors, combined movement of anchor relative to building structure, and framing member relative to anchor: 1/16 inch (1.5 mm) maximum in any direction.
 - e. Do not exceed the allowable values for stresses established by the specifications listed in code standards. Do not exceed the yield stress in determining allowable values.
 - f. Where permitted by code, a 1/3 increase in allowable stress for wind or seismic load is generally acceptable. Do not apply a 1/3 increase in combination with any reduction applied to combined loads.
 4. Limit net permanent deflection at 1.5 times the design pressure loads to 1/1000 span maximum, for steel framing members supporting EIFS. No failure or gross permanent

- distortion of framing members, anchors or connections is permitted. At connection points of framing members to anchors, combined movement of anchor relative to building structure, and framing member relative to anchor, shall not exceed 1/16 inch (1.5 mm) set after load is removed.
5. Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening or fracturing of attachments or components of system are not permitted in the installed work.
 6. Headed concrete studs welded to steel elements and cast-in-place with structural concrete shall have a minimum safety factor of 2.0 against ultimate failure. Unistrut type or ferrule type concrete inserts shall have minimum safety factor of 3.0 against ultimate failure. All drilled expansion or wedge type anchors shall have a minimum safety factor of 4.0 against ultimate failure. Use of 1/3 increase for allowable stresses is not acceptable unless written approval by manufacturer is provided.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ClarkWestern Building Systems, Inc.
 2. Dietrich Metal Framing; a Worthington Industries Company.
 3. MarinoWARE.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
 2. Coating: G90 (Z275) or equivalent.
- B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
 2. Coating: G90 (Z275).

2.4 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0677 -inch (1.72 mm) (14 gage).
 2. Flange Width: 1-5/8 -inches (41 mm) .
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs unless indicated otherwise on Drawings.
 2. Flange Width: 1-1/4 -inches (32 mm) .

COLD-FORMED METAL FRAMING

- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 -inch (1.37 mm) unless indicated otherwise on Drawings.
 2. Flange Width: 1-3/8 -inches (35 mm) unless indicated otherwise on Drawings .
 3. Section Properties: As indicated .
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
1. Minimum Base-Metal Thickness: As indicated. .
 2. Top Flange Width: 1-1/2 -inches (38 mm) unless indicated otherwise on Drawings.
 3. Section Properties: As indicated on Drawings. .

2.5 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As indicated on Drawings.
 2. Flange Width: 1-5/8 -inches (41 mm) unless indicated otherwise on Drawings. minimum.
 3. Section Properties: <Insert minimum allowable calculated section modulus, moment of inertia, and allowable moment>.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36 , threaded carbon-steel and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C or mechanically deposition according to ASTM B 695, Class 50.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: Type specified in .Section 05 5000.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 -inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

- A. General: Framing components may be pre-assembled into panels prior to erecting.
- B. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- C. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.
- D. Provide insulation as specified elsewhere in all double jamb studs and double header members, which will not be accessible to the insulation contractor.
- E. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- F. Axially Loaded Studs:
 - 1. Install studs to have full bearing against inside track web (1/8 inches (3.2 mm) maximum gap) prior to stud and track attachment.
 - 2. Splices in axially loaded studs are not permitted.
 - 3. Fasteners: Fasten components using self-tapping screws or welding.
- G. Welding: Welding is permitted on 18 gauge or heavier material only.
 - 1. Specify welding configuration and size on the Structural Calculation submittal.
 - 2. Qualify welding operators in accordance with Section 6.0 of AWS D.1.3.
 - 3. Touch up all welds with zinc-rich paint in compliance with ASTM A 780.
- H. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 -inch in 10 -feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 -inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 -inch (3 mm).

2.10 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 - 2. Flange Width: As indicated on Drawings, minimum.
 - 3. Section Properties: As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine previous work of all other trades, supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than **1/4 inch (6 mm)** to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding **1/16 -inch (1.6 mm)**.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of **1/8 -inch in 10 -feet (1:960)** and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of **1/8 -inch (3 mm)** between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection. Provide one of the following:
 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 -inches (150 mm) deep.
 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of **1-1/2 -inches (38 mm)**.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than **2 -inches (51 mm)** from abutting walls, and as follows:
 - 1. Joist Spacing: As indicated.
 - 2. Joist Spacing: As indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.

- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

- END OF SECTION -

- SECTION 05 5000 -**METAL FABRICATIONS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Shop fabricated metal items and miscellaneous metal work to include the following, but not limited to:
1. General:
 - a. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - b. Steel weld plates and angles for casting into concrete not specified in other Sections.
 - c. Steel framing and supports for mechanical and electrical equipment.
 - d. Steel assemblies as indicated and detailing in drawings
 - e. Steel assemblies as herein specified
 - f. Steel framing and supports for overhead counter doors and horizontal shutters/doors.
 - g. As herein additionally listed.
 - h. Miscellaneous materials
 - i. Miscellaneous Steel Trim
 - j. Fasteners and Anchors
 - k. Rough Hardware
 - l. Framing and Supports
 - m. See also Schedule, Part 3
 2. Loose Bearing and Leveling Plates for;
 - a. Applications where they are not specified in other Sections.
 3. Loose Steel Lintels
 4. Steel Weld Plates and Angles
 5. Channel Brackets, Lateral Supports, Inserts, Angle Fames & Shelf Angles
 - a. Channel Brackets - Cavity wall brackets
 - b. Lateral Supports - Storefront/Window wall and Curtain wall
 - c. Inserts - Wedge type anchors

- d. Angle frames - Vanity & Counter top support framing
- e. Shelf angles
- f. Vanity & Counter top support framing
- 6. Elevator - Steel shapes for supporting Elevator Hoistway Door Sills.
- 7. Elevator - Metal elevator Pit ladder.
- 8. Elevator - Elevator Hoistway Beams and Divider Beams.
- 9. Elevator - Divider Screens
- 10. Vertical Access Ladder
- 11. Vertical Access Ladder with parapet step over and platform
- 12. Ladder Assist Safety Posts
- 13. Pipe Guards
- 14. Steel framing and supports for operable partitions
- 15. Low wall Tube Steel and Angle Steel Bracing
- 16. Steel framing and supports for mechanical and electrical equipment.
- 17. Corner Guards – Horizontal and vertical
 - a. Corner Wall guards - vertical
 - b. Corner slab edge angles - horizontal
 - c. Column end side channel guards – vertical
 - d. End of wall full width channel guards - vertical
- 18. Metal Banding – Exterior Walls Products furnished, but not installed, under this Section:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
 - 3. Mechanical Screen – Exterior custom fabricated Mechanical screen structure with metal wall panels & Gates/Doors
 - a. Refer to Section 10 8213 “Exterior Screened Enclosures”

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4339 “Mock-up Requirements”.
- C. Section 01 6116 “Volatile Organic Compound (VOC) Restrictions”
- D. Section 01 7329 “Cutting and Patching”.
- E. Section 01 7400 “Cleaning and Waste Management”.
- F. Section 03 3000 “Cast-in-Place Concrete” for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts and other items cast into concrete.
- G. Section 04 2000 “Concrete Unit Masonry” for installing loose lintels, anchor bolts, and other items built into unit masonry.
- H. Section 05 0605 “Welded Stud Anchors”.

METAL FABRICATIONS

- I. Section 05 0810 "Galvanized Finishes on Steel" for field touchup of galvanized finishes.
- J. Section 05 0900 "Anchors and Fasteners".
- K. Section 05 1200 "Structural Steel"
- L. Section 05 5213 "Pipe & Tube Railings" for fabricated metal railing system.
- M. Section 05 5300 "Metal Gratings" for grate and frames for grates.
- N. Section 05 7000 "Decorative Metal"
- O. Section 05 7300 "Decorative Metal and Glass Railings".
- P. Section 07 7200 "Roof Accessories" for Roof Hatches and Hatch Railing System.
- Q. Section 09 9600 "High Performance Coatings" for preparation, priming with compatible products and finish paint coatings.
- R. Section 10 7500 "Flagpoles".
- S. Section 10 7316 "Custom Steel Canopies"
- T. Section 10 8213 "Exterior Screened Enclosures" for roof top mechanical screens with continuous louvers.
- U. Section 14 2100 "Electric Traction Elevators"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM International, American Society and Material Testing:
 - 1. Standards as herein specified in body of specification.
 - 2. A27 "Standard Specification for Steel Castings, Carbon, for General Application"
 - 3. A36 "Standard Specification for Carbon Structural Steel".
 - 4. A47 "Standard Specification for Ferritic Malleable Iron Castings"
 - 5. A48 "Standard Specification for Gray Iron Castings"
 - 6. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
 - 7. A123 "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products"
 - 8. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
 - 9. A307 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength"
 - 10. A563 "Standard Specification for Carbon and Alloy Steel Nuts"
 - 11. A615 "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"

12. A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings"
 13. B633 "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel"
 14. C1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)"
 15. E488 "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements"
 16. F593 "Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs"
 17. F594 "Standard Specification for Stainless Steel Nuts"
 18. F1554 "Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength"
- C. [Federal Specifications \(FS\)](#) Publications:
1. [FS](#) B 588 "Bolt, Toggle: And Expansion Sleeve, Screw" (Cancelled)
 2. [FS](#) FF S 325
 3. [FS](#) FF BS75
 4. [FS](#) TT P664 - Paint 25 (superceeds FS TT-P-664), Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel"
 5. DOD-P-21035A (formerly MIL-P-21035), Galvanizing Repair Specification
- D. [The American Society of Mechanical Engineers \(ASME\)](#) Publications:
1. A17.1 "Handbook on Safety Code for Elevators and Escalators"
 2. B18.2.1 "Square and Hex Bolts and Screws, Inch Series"
 3. B18.6.1 "Wood Screws (Inch Series)"
 4. B18.6.3 "Machine Screws and Machine Screw Nuts"
 5. B18.21.1 "Lock Washers (Inch Series)"
 6. B18.22.1 "Plain Washers"
- E. [American Welding Society \(AWS\)](#) Publications:
1. D1.1 "Structural Welding Code - Steel"
 2. D1.2 "Structural Welding Code--Aluminum"
 3. D1.3 "Structural Welding Code - Sheet Steel"
 4. AWS D1.6 / D1.6M, "Structural Welding Code – Stainless Steel."
- F. [National Association of Architectural Metal Manufacturers \(NAAMM\)](#) Publications:
1. "Metal Finishes Manual"
 2. "Metal Stairs Manual"
- G. [The Society for Protective Coatings \(SSPC\)](#) Publications:
1. [SP - Surface Preparation Standards and Specifications](#)
 - a. SP 3 "Power Tool Cleaning"
 2. [PA - Paint Application Standards, Guides, and Specifications](#)
 - a. PA 1 "Shop, Field, and Maintenance Painting of Steel"
 3. [Paint - Paint and Coating Standards and Specifications](#)
 - a. Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film)
 - b. Paint 20 "Zinc-Rich Coating, Type I - Inorganic and Type II - Organic"

- c. Paint 25 (superceeds FS TT-P-664), Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel"
- H. National Ornamental & Miscellaneous Metals Association (NOMMA) Guideline 1, www.nomma.org
- I. SSNIA, Specialty Steel Industry of North America, 'Designer Handbook' for; 'Stainless Steel For Handrails, Railings & Barrier Applications', www.ssina.com .

1.5 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
 - 1. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Paint products.
 - 3. Grout.
 - 4. Materials.
 - 5. Finishes.
- D. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections.
 - a. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 4. Shop drawings shall indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevation, and details where applicable. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
 - 5. Literature and shop drawings for pre-manufactured assemblies including, but not limited to;
 - a. Ladder Assist Safety Posts.
 - b. Ladders
 - c. Ladder with Cage and Walk-Through Platform with Railing
 - d. Cages
- E. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for the preparation.
- C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- D. Welding certificates.
- E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- F. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.
- G. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.7 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Standards and References: (Latest Edition unless otherwise noted)
- B. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- C. Installer Qualifications: Arrange for installation of metal fabrications specified in this Section by same firm that fabricated them.
- D. Standards and References: (Latest Edition unless otherwise noted)
- E. Building codes as herein listed and indicated in drawings.
- F. ASTM International for ASTM Specifications as listed in the Section.
- G. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. [AWS](#) D1.3 "Structural Welding Code - Sheet Steel"
 - 4. AWS D1.6, "Structural Welding Code - Stainless Steel."

METAL FABRICATIONS

- H. Certify that each welder has satisfactorily passed [AWS](#) qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- I. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual".

1.9 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
 - 2. Deliver such items to Project site in time for installation.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver all parts ready for erection; store in close proximity to final locations.

1.11 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Delegated Design: Including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces .
- E. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- F. Structural Performance of Alternating Tread Devices: Alternating tread devices shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. -inches. (2580 sq. mm).
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Alternating Tread Device Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS MATERIALS

- A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304 .
- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304 .
- E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- G. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
 1. Black finish, unless otherwise indicated.
 2. Galvanized finish for exterior installations, unless shown to receive special coatings.
 3. Type E, OR S, Grade B, Fy = 35 KSI, unless otherwise indicated, or another weight, type, and grade required by structural loads.
- I. Zinc-Coated Steel Wire Rope: ASTM A 741.

METAL FABRICATIONS

1. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- J. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: As indicated
 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, **Grade 33 (Grade 230)**, with **G90 (Z275)** coating; **0.108-inch (2.8-mm)** nominal thickness.
 - a. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, **Grade 33 (Grade 230)**; **0.0966-inch (2.5-mm)** minimum thickness; hot-dip galvanized after fabrication.
 3. Fittings and Brackets: Steel, manufacturer's standard shape required to assemble configurations indicated.
- K. Gray Iron Castings: [ASTM](#) A48, Class 30
- L. Malleable Iron Castings: [ASTM](#) A47, Grade 32510
- M. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- N. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- O. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, [ASTM](#) A47, or cast steel, [ASTM](#) A27. Provide bolts, washers, and shims as required, hot-dip galvanized per [ASTM](#) A153.
- P. Steel Bolts, Nuts, and Washers: ASTM A307.
- Q. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- R. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- S. Welding Materials: AWS D1.1; type required for materials being welded.
- T. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface. Where damaged, repair surface with one coat of hot process galvanizing repair compound, "Galvalloy", Galvweldalloy", or approved equal.
 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- U. Primer: Provide primers that comply with Section 09 9600 "High Performance Coatings".
- V. Dissimilar Materials: Separate dissimilar surfaces in contact with or in close proximity to non-compatible metals, concrete masonry, or plaster with neoprene gasket; or other approved means.
- W. Expansion Bolts: Hilti "Kwik Bolt III" Expansion Anchor Bolts, galvanized unless otherwise indicated.

- X. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- E. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).
- F. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- G. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).
- H. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.
- I. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent lead nickel bronze).

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
- D. Comply with Section 09 9600 "High-Performance Coatings"

2.6 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Division 9 Section "High-Performance Coatings".
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

METAL FABRICATIONS

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Items Indicated to Receive Primers Specified in Division 9 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- E. Stainless Steel Finishes:
1. Remove tool and die marks and stretch lines or blend into finish.
 2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 3. Bright, Directional Satin Finish: No. 4.
 4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

2.8 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or **ASTM F 1941 (ASTM F 1941M)**, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless-steel fasteners for fastening aluminum.
 2. Provide stainless-steel fasteners for fastening stainless steel.
 3. Provide stainless-steel fasteners for fastening nickel silver.
 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, **ASTM A 325, Type 3 (ASTM A 325M, Type 3)**; with hex nuts, **ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3)**; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, **ASTM F 593 (ASTM F 738M)**; with hex nuts, **ASTM F 594 (ASTM F 836M)**; and, where indicated, flat washers; Alloy Group **2 (A4)**.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- F. Lag Bolts: Square head type, [ASME B18.2.1](#)
- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or [ASTM F 1941](#) ([ASTM F 1941M](#)), Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 ([A1](#)) stainless-steel bolts, [ASTM F 593](#) ([ASTM F 738M](#)), and nuts, [ASTM F 594](#) ([ASTM F 836M](#)).
- I. Eyebolts: ASTM A 489.
- J. Machine Screws: [ASME B18.6.3](#) ([ASME B18.6.7M](#)).
- K. Lag Screws: [ASME B18.2.1](#) ([ASME B18.2.3.8M](#)).
- L. Plain Washers: Round, [ASME B18.22.1](#) ([ASME B18.22M](#)).
- M. Lock Washers: Helical, spring type, [ASME B18.21.1](#) ([ASME B18.21.2M](#)).
- N. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per [ASTM E488](#), conducted by a qualified independent testing agency.
 1. Interior Use - Material: Carbon-steel components zinc-plated to comply with [ASTM B633](#), Class Fe/Zn 5.
 2. Exterior and Swimming Pool Use - Material: Alloy Group 1 or 2 stainless-steel bolts complying with [ASTM F593](#) and nuts complying with [ASTM F594](#).
- O. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, [1-5/8 -inches](#) by [7/8 inches](#) ([41 by 22 mm](#)) by length indicated with anchor straps or studs not less than [3 -inches](#) ([75 mm](#)) long at not more than [8 -inches](#) ([200 mm](#)) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.
- P. Toggle Bolts: [FS FF-B-588](#), tumble-wing type, class and style as needed.

2.9 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface.
- C. Zinc Repair Solder: For hot zinc galvanizing repair.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- D. Galvanizing Repair Primer: (Field top coated)
 - 1. Application: Where galvanizing is damaged, repair surface with one coat of Galvanizing Repair Paint.
 - a. For site touch up only.
 - 2. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- E. Galvanizing Repair Paint: (Left exposed)
 - 1. Application: Where galvanizing is damaged, repair surface with one coat of Galvanizing Repair Paint.
 - a. For site touch up only.
 - 2. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- F. Primer: (Interior)
 - 1. Application: A "shop or field" compliant rust inhibitive primer/finish for painting of ferrous metal, structural and miscellaneous steel for interior dry exposure. Also suitable over galvanized steel and organic zinc-rich coatings in wet exposures. A water-borne equivalent to "Standard Alkyd Shop Primer". Provide primers that are compatible with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."
 - 2. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- G. Dissimilar Materials: Separate dissimilar surfaces in contact with or in close proximity to non-compatible metals, concrete masonry, or plaster with neoprene gasket; or other approved means.
- H. Expansion Bolts: Hilti "Kwik Bolt III" Expansion Anchor Bolts, galvanized unless otherwise indicated.
- I. Shop Primers: Provide primers that comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."
- J. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- K. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- L. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

- M. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- N. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of **3000 psi (20 MPa)**.
- O. Flag Sleeves: Hot-dipped galvanized, formed as detailed, for embedment into concrete sidewalk where indicated in drawings.

2.10 GROUT AND ANCHORING CEMENT

- A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with [ASTM C1107](#). Provide grout specifically recommended by manufacturer for interior and exterior heavy-duty loading applications of type specified in this Section.
- B. Avendra, LLC Preferred Manufacturers:
 - 1. None
- C. Approved Manufacturers:
 - 1. "Euco N-S Grout", [Euclid Chemical Co, An RPM Company](#) (800-321-7628)
 - 2. " Masterflow 713 Plus ", [Degussa Building Systems, Inc](#) (800-243-6739)
 - 3. " SonogROUT 10K ", [Degussa Building Systems, Inc](#) (800-243-6739)
- D. Interior Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.
- E. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

2.11 CONCRETE FILL AND REINFORCING MATERIALS

- A. Concrete Materials and Properties: Comply with requirements of Section 03 3000, and as shown on Drawings, with minimum 28-day compressive strength of 3,000 PSI, unless otherwise indicated.
- B. Non-slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rustproof and non-glazing; unaffected by freezing, moisture, or cleaning materials.
- C. Reinforcing Bars: [ASTM](#) A615, Grade 60, unless noted otherwise.

2.12 PAINT

- A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead and chromate-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-664.
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. Tneme-Zinc 90-97; [Tnemec Co.](#) (800-863-6321)
 - b. Carbozinc 621"; [Carboline Co.](#) (800-848-4645)
 - c. "Epoxy Zinc-Rich Primer CM18/CM19"; [Benjamin Moore & Co.](#) (888-236-6667)
- B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or [SSPC](#) Paint 20.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- C. Zinc Chromate Primer: [FS](#) TT-P-645.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- D. Bituminous Paint: Cold-applied asphalt mastic complying with [SSPC](#) Paint 12 except containing no asbestos fibers.
- E. All steel to be fireproofed shall not be primed.

2.13 FABRICATION - METALS GENERAL

- A. Metal Surfaces, General:
 - 1. Provide materials with smooth, flat surfaces, unless otherwise indicated.
 - 2. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
 - a. Refer to Section 05 1213 "Architecturally-Exposed Structural Steel (AESS) Framing"
- B. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): **120 deg F.**
- C. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Use connections that maintain structural value of joined pieces.
 - 3. Clearly mark units for reassembly and coordinated installation.

4. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- D. Weld corners and seams continuously to comply with the following:
1. Refer also to Section 05 1213 "Architecturally-Exposed Structural Steel (AESS) Framing"
 2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 3. Obtain fusion without undercut or overlap.
 4. Remove welding flux immediately.
 5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible.
1. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated.
 2. Locate joints where least conspicuous.
 3. Comply with Section 05 1213 "Architecturally-Exposed Structural Steel (AESS) Framing"
- G. Weld corners and seams continuously to comply with the following:
1. Comply with Section 05 1213 "Architecturally-Exposed Structural Steel (AESS) Framing"
 2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 3. Obtain fusion without undercut or overlap.
 4. Remove welding flux immediately.
 5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- H. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
1. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated.
 2. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible.
 4. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts. Locate joints where least conspicuous.

METAL FABRICATIONS

- J. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- K. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water.
 - 1. Provide weep holes where water may accumulate.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- M. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- N. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately **1/32 -inch (1 mm)** unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- O. Provide for anchorage of type indicated; coordinate with supporting structure.
 - 1. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- P. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, **1/8 -inch by 1-1/2 -inches (3.2 mm by 38 mm)**, with a minimum **6-inch (150-mm)** embedment and **2-inch (50-mm)** hook, not less than **8 -inches (200 mm)** from ends and corners of units and **24 -inches (600 mm)** o.c., unless otherwise indicated.
- Q. Shear and punch metals cleanly and accurately.
 - 1. Remove burrs.
- R. Ease exposed edges to a radius of approximately **1/32 -inch**, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- S. Remove sharp or rough areas on exposed traffic surfaces.
- T. Provide for anchorage of type indicated; coordinate with supporting structure.
 - 1. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.14 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.
 - 1. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.15 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports.
 - 1. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection.
 - 2. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 3. Equip units with integrally welded anchors for casting into concrete or building into masonry.
 - a. Furnish inserts if units must be installed after concrete is placed. Spacing of anchors shall not be more than **24 -inch** o.c.
 - 4. Fabricate units from slotted channel framing where indicated.
 - 5. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide **1/2 -inch (12.7-mm)** baseplates with four **5/8 -inch (16-mm)** anchor bolts and **1/4 -inch (6.4-mm)** top plates.
- E. Galvanize miscellaneous framing and supports where indicated.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
 - 2. Prime and finish paint miscellaneous framing and supports per Section "High-Performance Coatings" where indicated.
 - 3. All exterior metal locations, unless noted otherwise and/or specified otherwise.
 - 4. Interior locations where indicated unless noted otherwise and/or specified otherwise.

2.16 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and **24 -inches** o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.
- C. Galvanize shelf angles to be installed in exterior walls.

METAL FABRICATIONS

2.17 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.
- B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 -inches from each end, 6 -inches from corners, and 24 -inches o.c., unless otherwise indicated.
- C. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.
 - 1. Galvanize miscellaneous framing and supports in exterior locations and where shown to be painted.
- D. Galvanize miscellaneous steel trim in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated unless noted otherwise and/or specified otherwise.
- E. Prime and finish paint miscellaneous framing and supports per Section "High-Performance Coatings" typically, unless specified and/or indicated to be left as galvanized finish.

2.18 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction.
 - 1. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

2.19 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 5 -inches unless otherwise indicated.
- C. Hot-dipped galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

- E. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, if not indicated on Drawings.

2.20 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work.
1. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.21 CORNER GUARDS

A. Corner Wall Guards - Vertical:

1. Schedule:
 - a. Parking garage levels.
 - b. Roll up door wall opening at Trash room
 - c. Wall opening for vehicular access into parking garage, ground level
 - d. Where indicated.
 - e. Interior wall guards for finished gypsum board walls, refer to Division 10.
2. Assembly:
 - a. Provide steel angle corner guards extending;
 - 1) 4 -inches above finish floor
 - 2) 4 -inches above top of concrete curb where occurs.
 - 3) Length: 48 -inches
 - 4) Size: Refer to drawings for multiple sizes, included but not limited to;
 - a) 5 -inch x 5 -inch x 3/8 -inch angle
 - b) 4 -inch x 4 -inch x 3/8 -inch bent plate angle
 - b. Anchor both flanges of angles to masonry wall and/or concrete columns with (6) 3/8-inch diameter Redhead fasteners each leg with 2 1/2 -inch minimum embedment and equally spaced with 3 -inch minimum clearance at each end of angle and offset from opposite flange by 3 -inches.
3. Material / Finish:
 - a. Galvanize after fabrication and then painted
 - 1) Parking Garage:
 - a) Refer to Section 09 9600 "High-Performance Coatings".

B. Corner Slab Edge Angles - Horizontal:

1. Schedule: Where indicated
2. Description:
 - a. Provide edge of slab corner angle with Nelson embed bolts or field mechanically anchored when approved by Architect.
 - b. Provide edge angles and anchors for placement in fresh concrete.
 - c. Galvanize exterior edge angles after fabrication.
3. Material:
 - a. 5 -inch x 5 -inch x 3/8 -inch steel bent plate angles

METAL FABRICATIONS

4. Profiles:
 - a. 90 Degree angle, refer to details
 - b. Chamfered angle, refer to details
5. Assembly:
 - a. Anchor edge angles to concrete with steel strap anchors welded to angles.
 - b. Provide edge angles and anchors for placement in fresh concrete.
 - c. Complete with anchors and bolts.
 - 1) For casting in concrete, space anchors 16 -inches OC with 1-1/4 -inches by 1/4 -inch by 8 -inches steel straps.
 - 2) For mechanically fastening, space anchors at 24 -inches o.c. and 6 -inches from ends and fasten with 3/8 -inch diameter x 2 1/2 -inch minimum embedment Redhead fasteners.
 - a) Stagger fasteners from one side of angle to other by 6 -inches minimum

C. Column end side channel guards - Vertical:

1. Schedule:
 - a. Parking garage levels where indicated.
 - b. Interior wall guards for finished gypsum board walls, refer to Division 10.
2. Assembly:
 - a. Provide steel channel column guards extending;
 - 1) 4 -inches above finish floor
 - 2) 4 -inches above top of concrete curb where occurs.
 - 3) Length: 48 -inches
 - 4) Size: Refer to drawings for sizes, included but not limited to;
 - a) 5 -inch x column width x 5 -inch x 3/8 -inch thick bent plate channel (Fields verify column widths)
 - b. Anchor flanges of bent plate channel to masonry wall and/or concrete columns with (9) 3/8-inch diameter Redhead fasteners each leg with 2 1/2 -inch minimum embedment and equally spaced with 3 -inch clearance at each end of angle.
 - c. Anchor web (face) of bent plate channel at column face with (9) 3/8-inch diameter Redhead fasteners down the center of column, equally spaced and offset 3 inches from the ones at the flanges with 2 1/2 -inch minimum embedment.
3. Material / Finish:
 - a. Galvanize after fabrication and then painted
 - 1) Parking Garage:
 - a) Refer to Section 09 9600 "High-Performance Coatings".

2.22 CHANNEL BRACKETS, LATERAL SUPPORTS, INSERTS, ANGLE FRAMES & SHELF ANGLES

A. General:

1. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive **3/4 -inch (19-mm)** bolts, spaced not more than **6 -inches (150 mm)** from ends and **24 -inches (600 mm)** o.c., unless otherwise indicated.
 - a. Provide mitered and welded units at corners.
 - b. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately **2 -inches (50 mm)** larger than expansion or control joint.
2. Complete with anchors and bolts. For casting in concrete, space anchors **24 -inches** OC with **1-1/4 -inches** by **1/4 -inch** by **8 -inches** steel straps.
3. Finish: Universal primer.
 - a. All paints and coatings within the vapor barrier must meet the VOC levels listed in Section 01 8113 "Sustainable Design Requirements.
 - b. Provide primers that comply with Section 09 9600 "High Performance Coatings".
 - c. Paint in accordance with Section 09 9600 "High-Performance Coatings"
 - d. Galvanized where indicated and/or specified.
 - 1) Refer to Section 05 0810 "Galvanized Finishes on Steel"
4. Locate supports as required by manufacturer to suspend partitions from structure above without sags or undue deflection affection operation of partitions.

B. Channel Brackets - Cavity Walls

1. Provide vertical channel brackets to support angles from backup masonry and concrete.
2. Provide vertical channel brackets to support angles from backup masonry and concrete.

C. Storefront /Window Wall / Curtain wall - Lateral Supports:

1. Structural steel angles, sized for spans and wind loads, to support storefronts to structures.
2. Securely fasten angles to storefront and structure.

D. Wedge-type concrete inserts,

1. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete. For casting in concrete, space anchors **24 -inches** OC with **1-1/4 -inches** by **1/4 -inch** by **8 -inches** steel straps.
2. Furnish complete with fasteners to attach shelf angles to cast-in-place concrete.

E. Vanities and Countertops:

1. Provide steel angle framing to support countertops.

F. Shelf Angles:

1. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete ubstrate. Provide horizontally slotted holes to receive **3/4 -inch (19-mm)** bolts, spaced not more than **6 -inches (150 mm)** from ends and **24 -inches (600 mm)** o.c., unless otherwise indicated.
 - a. Provide mitered and welded units at corners.

- b. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately **2 -inches (50 mm)** larger than expansion or control joint.

2.23 ELEVATOR - METAL ELEVATOR HOIST WAY DOOR SILLS

A. General:

- 1. Steel angle, refer to drawings

2.24 ELEVATOR - METAL PIT LADDER

A. General:

- 1. Comply with ANSI A14.3 unless otherwise indicated.
- 2. For elevator pit ladders, comply with ASME A17.1.
- 3. Refer to drawings including, but not limited to detail 5/A7.4
- 4. Fabricate ladders for the locations shown, with dimensions, spacings, and anchorages as indicated. Comply with requirements of [ANSI](#) A14.3.
 - a. For elevator pit ladders, comply with [ASME](#) A17.1.

B. Galvanized Steel Ladders:

- a. Space siderails **24 -inches** apart unless otherwise indicated.
- 2. Siderails: Continuous, **1/2 -inches** by-**2 1/2 -inch** steel flat bars, with radius round ends.
- 3. Rungs: **3/4 -inch** diameter steel bars.
- 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
- 5. Provide nonslip surfaces on top of each rung by coating with abrasive material metalically bonded to rung.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) IKG Industries, a division of Harsco Corporation; Mebac.
 - 2) SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.
- 6. Support each ladder at top, middle and bottom and not more than **40 -inches** o.c. with welded steel brackets.
- 7. Hot Dip Galvanized ladders, including brackets and fasteners.

C. Prime ladders, including brackets and fasteners, with primer specified in Section 09 9600 "High-Performance Coatings."

2.25 LADDER ASSIST "LadderUp" SAFETY POSTS

A. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to access ladders and/or roof-access ladder.

- 1. Operation: Post locks in place on full extension; stainless steel release mechanism returns post to closed position.
- 2. Mfgr: [Bilco, www.bilco.com](http://www.bilco.com)
- 3. Model: LadderUp® Safety Post
- 4. Number:

- a. LU-1 Steel, Yellow powder coated
- 5. Assembly:
 - a. Height: 42 -inches (1060 mm) extension from fixed location.
 - b. Material: Steel tube .
 - c. Post: Tubular
 - d. Lift handle: Vinyl coated
 - e. Mounting channel: Adjustable
 - f. Fasteners: Stainless steel
 - g. Finish: Manufacturer's standard as herein indicated
 - 1) LU-1 Steel, Yellow powder coated

2.26 ELEVATOR - METAL ELEVATOR HOIST WAY BEAMS & DIVIDER BEAMS

- A. General:
 - 1. Refer also to;
 - a. Section 14 2100 "Electric Traction Elevators"
 - 2. Refer to drawings
 - 3. Comply with ASME A17.1.
- B. Hoistway Beam::
 - 1. Refer to Structural drawings
- C. Divider Beam::
 - 1. Refer to Structural drawings

2.27 ELEVATOR - DIVIDER SCREENS

- A. Basis of Design: Provide "Elevator Hoistway Divider Screens" as manufactured by American Wire, Inc located in San Bernardino, CA, (909) 884-9900, web: www.americanwirecorp.com, or similar meeting the requirements of ASME A17.7 and of this Section.
 - 1. Refer also to Section 14 2100 "Electric Traction Elevators"
 - 2. Refer to drawings.
- B. Mesh: 0.135 -inch- diameter (10 GA), intermediate-crimp steel wire woven into 1-1/2 -inch diamond mesh, clinched to channel frames.
- C. Vertical Panel Framing: 1-1/4 -inch by-5/8 -inch by-0.0966 -inch minimum cold-rolled, C-shaped steel channels with 1/4 -inch diameter bolt holes spaced not more than 18 -inches o.c. along center of framing.
- D. Horizontal Panel Framing: 1 -inch by-1/2 -inch by-1/8 -inch cold-rolled steel channels.
- E. Horizontal Panel Stiffeners: 1 -inch by-1/2 -inch by-1/8 -inch cold-rolled steel channels with wire woven through, using mortise and tenon construction for extra strength
- F. Center Stiffeners: (2) 1 -inch x 1/2 -inch roll formed 12 gauge channels riveted and welded for greater strength and rigidity. or two 1 -inch by-3/8 -inch by-1/8 -inch cold-rolled steel channels bolted or riveted toe to toe through mesh

METAL FABRICATIONS

- G. Top Capping Bars: 2-1/4-inch by 1-inch cold-rolled steel channels with 1/4 -inch 'U' bolts 24 -inch o.c.
- H. Floor Shoes: Steel, cast iron, or cast aluminum, 2 -inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.
- I. Accessories:
 - 1. Wall Clips: Manufacturer's standard, cold-rolled steel sheet; allowing up to 1 -inch of adjustment.
- J. Finishes for Interior Locations:
 - 1. Hot-dip galvanized
 - 2. Powder-coated finish.
 - a. Color: As selected by Architect from manufacturer's full range.
- K. Fabrication: General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-size components as recommended by wire mesh item manufacturer. Provide bolts, hardware, and accessories as required for complete installation.
 - 1. Fabricate wire mesh items to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and grind smooth, and finish sand.

2.28 OPERABLE PARTITION SUPPORT FRAMING

- A. General:
 - 1. Steel framing not supplied by partition manufacturer.
 - 2. Refer to structural drawings

2.29 LOW WALL TUBE STEEL AND ANGLE STEEL BRACING

- A. General:
 - 1. Refer to structural drawings

2.30 SUPPORT FRAMING FOR MECHANICAL AND/OR ELECTRICAL EQUIPMENT

- A. General:
 - 1. Refer to structural drawings
 - 2. Refer to mechanical drawings

2.31 FIXED STEEL LADDERS

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
 - 1. Comply with ANSI A14.3, unless otherwise indicated.
- B. Ladder Extensions: Provide ladder extension device (Ladder Assist "LadderUp" Safety Posts) for fixed ladders under access hatches and floor doors.

- C. Siderails: Continuous, 3/8 -inch by 2 -inch steel flat bars, with eased edges, spaced as shown on Drawings.
- D. Bar Rungs: 1 -inch-diameter steel bars, spaced 12 -inches o.c.
- E. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
- F. Support each ladder at top and bottom at intermediate points spaced and not more than 60 - inches o.c. with welded or bolted steel brackets.
 - 1. Size brackets to support design loads specified in ANSI A14.3 and to hold centerline of ladder rungs clear of the wall surface by minimum 7 inches.
- G. Provide nonslip surfaces on top of each rung by coating with abrasive material metallurgically bonded to rung by a proprietary process.
 - 1. Application:
 - a. Apply to rungs after they have been finish painted.
 - 2. Products: Subject to compliance with requirements, provide one of the following
 - a. Mebac; Harsco Industrial IKG.
 - b. SLIP-NOT; W. S. Molnar Company.
- H. Galvanize ladders, including brackets and fasteners, in the following locations
 - 1. Exterior.
- I. Finish:
 - 1. Painted in accordance with Section 09 9600 "High Performance Coatings"

2.32 FIXED STEEL LADDERS WITH PARAPET CROSSOVER AND PLATFORM

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
 - 1. Comply with ANSI A14.3, unless otherwise indicated.
 - 2. A36 Steel, ASTM A36
 - 3. HR steel channel, mild steel channel, steel C channel
 - 4. Tensile strength: 58-80,000 +/-
 - 5. Yield strength: 36,000 +/-
- B. Siderails: Continuous, 3/16 -inch by 2 -inch by 1 -inch steel channels, radiused as detailed, with eased edges, spaced as shown on Drawings.
- C. Bar Rungs: 1 -inch-diameter steel bars, spaced 12 -inches o.c.
 - 1. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
- D. Platform:
 - 1. Framing: Formed with 3/16 -inch by 2 -inch by 1 -inch steel channels welded together to sandwich a steel grate forming the platform walking surface.
 - 2. Steel Grate:
 - a. Mfg: Grating Pacific, www.gratingpacific.com or approved equal
 - b. Material: Hot Dip Galvanized steel

METAL FABRICATIONS

- c. Type: Steel bar grating
 - d. Model: TYPE W-19-2
 - 1) Bearing bars spaced at 1 3/16 -inch on center and close spaced cross bars at 2 -inches on center.
 - 2) Bearing bar size: 3/4 -inch by 1/8 -inch.
 - e. Surface: Serrated
 - f. Finish: Painted
 - g. Assembly: Welded to steel channels
- E. Support each ladder at top and bottom at intermediate points spaced and not more than 60 - inches o.c. with welded or bolted steel brackets.
- 1. Size brackets to support design loads specified in ANSI A14.3 and to hold centerline of ladder rungs clear of the wall surface by minimum 7 -inches.
 - 2. Install support brackets below platform at each side of parapet.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallicly bonded to rung by a proprietary process.
- 1. Application:
 - a. Apply to rungs after they have been finish painted.
 - 2. Products: Subject to compliance with requirements, provide one of the following
 - a. Mebac; Harsco Industrial IKG.
 - b. SLIP-NOT; W. S. Molnar Company.
- G. Galvanize ladders, including brackets and fasteners, in the following locations
- 1. Exterior.
- H. Finish:
- 1. Painted in accordance with Section 09 9600 "High Performance Coatings"

2.33 PIPE GUARDS

- A. General:
 - 1. Description:
 - a. Custom fabricated steel plate guards bolted with steel plates to concrete slab
- B. Material:
 - 1. Shape:
 - a. Profile: Refer to drawings
 - b. Base Plate: Refer to drawings but not less than 5 -inches larger than footprint of guard body / extent.
 - 2. Height: 26 -inches, min. unless detailed to be taller.
 - 3. Material: 1/2 -thick steel
 - 4. Edges: Radius and smooth
 - 5. Anchors: Drilled set anchor bolts
 - a. Refer to Structural drawings
 - 6. Finish: Primed and painted in accordance with;

a. Section 09 9600 "High Performance Coatings"

2.34 DOOR SILL

A. General:

1. Description: Custom fabricated steel plate door sill and anchor bolt secured to substrate.

B. Material:

1. Shape: Channel
2. Size: Refer to drawings and/or details
3. Material: Steel channel, refer to details
4. Edges: Radius and smooth
5. Anchors: Drilled set anchor bolts

2.35 CANOPY (A) – EXTERIOR, CUSTOM FABRICATED HORIZONTAL ASSEMBLY WITH SINGLE PLY ROOFING ASSEMBLY OVER STEEL DECKING AND INTEGRAL DRAINS

- A. Refer to Section 10 7316 "Custom Steel Canopies"

2.36 CANOPY (B) – EXTERIOR, CUSTOM FABRICATED CURVED ASSEMBLY WITH SINGLE PLY ROOFING ASSEMBLY OVER STEEL DECKING

- A. Refer to Section 10 7316 "Custom Steel Canopies"

2.37 METAL BANDING – EXTERIOR WALLS

A. Description: Built-up channel using plate steel

1. Material: Hot dip galvanized steel
2. Components:
 - a. Steel plates: Refer to Architectural and Structural Drawings
3. Fabrication:
 - a. Fully welded watertight: Refer to Architectural and Structural Drawings
4. Size: Refer to Architectural and Structural Drawings
5. Accessories:
 - a. Steel tubes: Refer to Architectural and Structural Drawings
6. Fasteners:
 - a. Steel bolts: Refer to Architectural and Structural Drawings
7. Finish: Painted
 - a. Refer to Section 09 9600 "High Performance Coatings"

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 INSTALLING PIPE GUARDS

- A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch bolts at each pipe guard. Mount pipe guards with top edge 26 inches above driving surface.

METAL FABRICATIONS

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum **2.0-mil (0.05-mm)** dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780

3.7 SCHEDULE

- A. Provide and install items shown on Drawings with anchorage and attachment necessary for installation. The following Schedule lists principal items only. Refer to drawing details for items not specifically scheduled.
 - 1. Miscellaneous plates or angles not attached to structural steel; complete with anchorage for embedment.
 - 2. Refer to Part 1 SUMMARY

- END OF SECTION -

- SECTION 05 5100 -**PRE-FABRICATED METAL STAIRS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. Manufactured Pre-engineered Steel-framed stairs with steel plate treads and slip resistant finish as herein specified including Stairs No. 1, 2, 3 & 4.
 2. Manufactured Pre-engineered Steel tube railings attached to metal stair stringers.
 3. Manufactured Pre-engineered Steel tube handrails attached to walls adjacent to metal stairs.
 6. Photoluminescent demarcation markings – Stair Egress:
 - a. Schedule:
 - 1) Handrail markings:
 - 2) Perimeter Demarcation options:
 - a) Floor mounted markings at landings and path of travel
 - b) Wall mounted markings at landings and path of travel
 - 3) Obstruction markings: (Alternating black and photoluminescent strips on strip)
 - a) On Obstructions
 - b) On vertical stand pipes
 - c) On horizontal portions of items such as Fire hose assemblies
 - 4) Floor in front of obstruction
 - 5) Landing Leading Edge marking as herein specified, Contrasting stripe.
 - 6) Final Exit Door Markings
 - a) Around door opening mounted to frame
 - 7) Lead edge of Stair Tread Nosing Marking, Contrasting stripe.
 - b.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"

- C. Section 03 3000 "Cast-In-Place Concrete"
- D. Section 03 3816 "Unbonded Post-Tensioned Concrete".
- E. Section 05 1200 "Structural Steel Framing".
- F. Section 05 4000 "Cold Formed Metal Framing" for metal backing for anchoring railings.
- G. Section 05 5000 "Metal Fabrications" for vertical access ladders and miscellaneous components.
- H. Section 05 5200 "Metal Railings" for steel plate, pipe and tube handrails with stairs specified under this section and other locations.
- I. Section 05 5150 "Architectural Metal Stairs" for monumental stair.
- J. Section 05 7300 "Decorative Metal and Glass Railings" for monumental stair railing system.
- K. Section 09 9600 "High Performance Coatings" for compatibility with shop primer and preparation for field application of high performance epoxy and urethane topcoats installed under Section 09 9600.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Standards and References: (Latest Edition unless otherwise noted)
 - 1. American Society for Testing and Materials (ASTM) Specifications as listed in the Section.
 - a. ASTM A 36/A 36M: Specification for Carbon Structural Steel
 - b. ASTM A 53: Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - c. ASTM A 123: Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - d. ASTM A 153/A 153M: Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - e. ASTM F 609-96: Non-slip surface test.
 - f. ASTM A 500: Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - g. ASTM A 563: Specification for Carbon and Alloy Steel Nuts
 - h. ASTM A 1011-A: Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
 - i. ASTM A 653/A 653M: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated Galvannealed by the Hot-Dip Process
 - j. ASTM A 786/A 786M: Specification for Rolled Steel Floor Plates
 - k. ASTM B 633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - l. ASTM C 1107: Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

- m. ASTM E 488: Test Method for Strength of Anchors in Concrete and Masonry Elements
- n. ASTM E 894: Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings
- o. ASTM E 935: Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings
- p. ASTM E 985: Specification for Permanent Metal Railing Systems and Rails for Buildings
- q. AWS D1.1: Structural Welding Code--Steel
- r. AWS D1.3: Structural Welding Code--Sheet Steel
- s. ASTM A307: Bolts
- 2. American Institute of Steel Construction's "Specification for Structural Steel Buildings".
- 3. American Welding Society's "Structural Welding Code" (AWS D1.1).
- 4. American Iron and Steel Institute's "Specifications for Design of Light Gauge Cold-Formed Stainless Steel Structural Members".
- 5. National Association of Architectural Metal Manufacturer's "Metal Stairs" (NAAMM-MS).
- 6. Steel Structures Painting Council's "Painting Manual":
 - a. Solvent Cleaning (SSPCC-SP 1).
 - b. Hand Tool Cleaning (SSPC-SP 2)
 - c. Brush-Off Blast Cleaning (SSPC-SP 7)
 - d. Hot Phosphate Surface treatment (SSPC-PT 4).
- 7. American Hot Dip Galvanizers Association, Inc. (AHDGA):
 - a. Inspection manual for hot dip galvanized products.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes, including the following:
 - 1. Steel stringers as herein specified
 - 2. Preprimed products.
 - 3. Abrasive slip resistant tread and landing surface.
 - 4. Factory installed and permanently bonded Tread safety contrasting photoluminescent glow strips
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.

2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the State of Arizona registered professional engineer responsible for their preparation.
 3. Show a large scale construction of various parts, methods of joining, thickness of metals, profiles of surfaces, reinforcing, anchorage, and structural supports. Include information regarding concealed and exposed joints, welds, and fastenings.
 4. Where welded connectors and concrete inserts are required to receive work, show size and locations required.
 5. Include design loads, structural calculations and material properties. Shop drawings shall be signed and sealed by a Professional Engineer licensed in State of Arizona.
- F. Samples for Verification: For the following products, in manufacturer's standard sizes:
1. Stair treads and landings with nonslip-aggregate surface finish.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.
 1. Test railings according ASTM E 894 and ASTM E 935.
- E. Closeout Submittals:
 1. Submit under provisions of Section 01 7700.
 2. Warranty: Submit specified warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have produced the types of stair and railing systems required for not less than ten (10) years, with not less than five (5) similar projects that have been in successful use for not less than five (5) years.
- B. Installer Qualifications: Minimum five (5) years experience in the successful installation of steel stair and railing systems of the type indicated for this project.
- C. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
- D. AWS D1.1 "Structural Welding Code - Steel", AWS D1.3 "Structural Welding Code – Sheet Steel" and AWS "Welding Procedure and Performance Qualification".
- E. NOMMA "Guideline 1 - Joint Finishes" (Most current Edition or Version is applicable)
- F. Welding: Qualify procedures and personnel according to the following:

PRE-FABRICATED METAL STAIRS

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

G. Design Criteria:

1. Work shall be designed to support normally imposed loads and conform to AISC requirements.
2. Built-up parts shall not exhibit warp.

H. Means of Egress Criteria:

1. Assembly shall be in accordance with Phoenix Building Construction Code.
2. Provide solid and continuous contrasting striping at leading edge of all Treads and Landings in accordance with Phoenix Building Construction Code.
3. Provide solid and continuous contrasting striping at handrail extensions in accordance with Phoenix Building Construction Code.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them.
1. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs.
1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete.
 2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

1.10 WARRANTY

- A. Provide manufacturer's written warranty that its standard products are free from defects in material and workmanship for the life of the building and agreeing to repair or replace items, proven to be defective, or refund the purchase price of the item.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Delegated Design: Engage a qualified professional engineer, as defined in;
1. Section 01 4000 "Quality Requirements" to design stairs and railings.
- D. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 -sq. inches (2580 sq. mm).
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 -inch (6.4 mm), whichever is less.
- E. Structural Performance of Railings: Provide railings as specified under Division 5 "Metal Railing Systems" capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails: Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - a. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 3. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.
 4. Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to loads per;
 - a. 2012 Phoenix Building Construction Code (2012 International Building Code, as amended with City of Phoenix, Arizona Amendments)
 5. Coordinate with drawings; see Structural General Notes

2.2 MANUFACTURER

- A. Basis of Design Product: Subject to compliance with requirements, provide **American Stair**, www.americanstair.com or comparable product by one of the following:
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. Worthington Metal Fabricators (formally Sharon Stair.)The Sharon Companies, Ltd. (800-792-0129)

2.3 METALS

- A. General:
 - 1. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500 (cold formed), Grade A.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- F. Wire Rod for Grating Crossbars: **ASTM A 510** (**ASTM A 510M**).
- G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- H. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25 unless another grade is required by design loads; exposed.
- I. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 unless another grade is required by design loads.
- J. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (**Z275**) coating, either commercial steel, Type B, or structural steel, Grade 33 unless another grade is required by design loads.
- K. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.4 TREADS AND LANDINGS AND ABRASIVE NOSINGS

- A. General:
 - 1. Factory installed slip resistant surface to treads and landings with continuous contrasting photoluminescent stripes.
- B. Products:
 - 1. Abrasive-Surface for Treads and Landings Floor Plate:
 - a. Mfg: American Stair, www.americanstair.com
 - b. Model: ENDURA
 - c. Compliance: ASTM F609-96
 - d. Material: Factory-applied slip-resistant grit surface permanently bonded to fiber-reinforced cement board with sheet steel backing and factory-welded to stringers with abrasive material metallicly bonded to steel.
 - 1) Color: As selected by Architect from manufacturer's full range of colors.

2.5 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Class 4.6; with hex nuts, ASTM A 563 and, where indicated, flat washers.
- C. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594
 - 2. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Refer also to structural drawings.
 - 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings" Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, slip resistant treads and landings and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding, unless otherwise indicated and/or required by stair manufacturer.

PRE-FABRICATED METAL STAIRS

2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible.
1. Disassemble units only as necessary for shipping and handling limitations.
 2. Clearly mark units for reassembly and coordinated installation.
 3. Factory Pre-prime stair assemblies and field prime after installation prior to painting
 - a. Refer to Section 09 9600 "High-Performance Coatings" for field priming and painting.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 -inch (1 mm)**, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Architectural Finish:
 - a. Weld exposed corners and seams continuously, unless otherwise indicated or as required by stair manufacturer.
 - b. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - 1) NOMMA #2 or better. (National Ornamental and Miscellaneous Metals Association)
 5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 6. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 7. Locate joints where least conspicuous.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water.
1. Provide weep holes where water may accumulate.

2.8 FABRICATED STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel channels, as detailed.
 - a. Size:
 - 1) Channel: 1 1/2 -inch wide by depth required for stair assembly as designed and engineered by stair manufacturer.
2. Construct platforms and intermediate landings of the following, but not limited to;
 - a. Steel channel headers
 - b. Stiffeners
 - c. Bent plate "Cans"
 - d. HSS Tube steel edge closures
 - e. Miscellaneous framing members as needed to comply with performance requirements.
3. Weld stringers to headers; weld framing members to stringers and headers.
4. Attach risers and subreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
5. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
6. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
7. Attach abrasive contrasting nosings to risers.

C. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.097 -inch (2.5 mm) .

1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

D. Accessories:

1. Photoluminescent markings for; Handrails, Floor Demarcations, obstructions, etc. within stair enclosures
 - a. As herein scheduled

2.9 STAIR RAILINGS

A. General:

1. Comply with applicable design and code compliant criteria as herein listed with requirements in Division 5 Section 05 5200 "Metal Railings" for railings, and as follows:
 - a. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings in accordance with mfr's standards.
 - b. Connect posts to stair framing by direct welding, unless otherwise indicated and approved.

- c. Railings installed with photoluminescent marking strips.

B. Models:

- 1. Type:
 - a. System(s):
 - 1) Multi-Strand 42 -inch High Guardrail with Round Rails, "In-Line" Posts and Continuous Handrail at 34 -inches above treads top mounted to channel stringer.
 - b. Wall Railing: Round wall rail with wall mounted brackets
- 2. Refer to drawings for locations of railing types.

C. Assembly:

- 1. Railings:
 - a. General:
 - 1) Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacing's, and anchorage, but not less than that needed to withstand indicated loads.
 - b. Rails and Framework:
 - 1) Size: 1-1/2-inch (38-mm-) O.D. by 14 gauge top and bottom rails.
 - 2) Height: 42 -inches
- 2. Posts:
 - a. General:
 - 1) Fabricate posts to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of railings, and anchorage, but not less than that needed to withstand indicated loads.
 - b. Type and Size:
 - 1) In-Line:
 - a) 1-1/2 inch O.D. by 3/16 inch tube steel rail posts.
- 3. Accessories:
 - a. Photoluminescent markings placed as continuous strip on top of handrails
 - 1) As herein scheduled

D. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

- 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 3 welds: partially dressed weld with spatter removed as shown in NAAMM AMP 521.

E. Form changes in direction of railings as follows:

- 1. As detailed.
- 2. By bending or by inserting prefabricated elbow fittings.
 - a. Code compliant

F. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

- G. Close exposed ends of railing members with prefabricated end fittings.
- H. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 -inch (6 mm)** or less.
- I. Connect posts to stair framing by direct welding unless otherwise indicated.
- J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
 - 2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 - 3. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
- K. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.10 GATES

- A. General:
 - 1. Comply with applicable design and code compliant criteria as herein listed and as follows:
 - a. Rails shall be continuous with radius corners using prefabricated fittings in accordance with mfg's standards.
 - b. Connect gates to walls and stair railings by direct welding, unless otherwise indicated.
 - c. Form gates from steel tube of same size and shape as top rails, with infill to match guards.
 - 1) Provide with cam-type, self-closing hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.
- B. Model:
 - 1. In fill panels: Match railing system
- C. Hardware:
 - 1. Hinges, spring type x quantity two (2)
 - 2. Stop: 1/4 -inch by 2 -inch by required length
- D. Finish:
 - 1. Match railing system
- E. Accessories:
 - 1. Photoluminescent markings placed as continuous strip on top of gate rail

PRE-FABRICATED METAL STAIRS

- a. As herein scheduled

2.11 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items located on the exterior of the building as indicated to comply with applicable standard listed below:
1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
 3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
1. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- E. Preparation of Surfaces:
1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting.
 2. Where hand cleaning methods are not adequate, clean in accordance with SSPC-SP 1 or, SSPC-SP 2 as required.
 3. Completely eliminate burrs, rough spots and pitting from normally exposed ferrous metal items.
- F. Finish painted in colors as indicated on Drawings for Railings, stair and risers.
1. Presume a different color for each assembly.
 - a. Railings
 - b. Stair assembly stringers and structure.
 - c. Risers
 2. Refer to Section 09 9600 "High Performance Coatings"
- G. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- H. VOC Content:
1. All paints and coatings within the vapor barrier must meet the VOC levels listed in Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- I. Accessories:
1. Photoluminescent markings
 - a. As here specified.
 - 1) As herein scheduled.

2.12 PHOTOLUMINESCENT MARKINGS – STAIR EGRESS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Balco, Inc., www.balcousa.com or a comparable product by one of the following:
1. ZERO International, www.zerointernational.com
 2. EverGlow, www.everglow.us
 3. BRADY, www.bradyid.com/bradyglo
- B. Photoluminescent Markings: Self-contained, single face, as follows for stairs and enclosures:
1. Manufacturer's standard Photoluminescent Demarcation markings
 - a. Handrail markings: Model 4010C
 - b. Perimeter Demarcation options:
 - 1) Floor mounted markings at landings and path of travel: Model 4211C
 - 2) Wall mounted markings at landings and path of travel: Model 4211C
 - c. Obstruction markings: (Alternating black and photoluminescent strips on strip)
 - 1) Obstruction: Model 4211OB
 - a) On vertical stand pipes.
 - b) On horizontal portions of items such as Fire hose assemblies.
 - 2) Floor in front of obstruction: Model 4211C
 - d. Landing Leading Edge marking: Integral Safety Tread per this Section.
 - e. Final Exit Door Markings: Model 4211C
 - 1) Around door opening mounted to frame.
 - f. Lead edge of Stair Tread Nosing Marking: Integral Safety Tread per this Section.
 2. Mounting: Self adhering.
 3. Face Color:
 - a. Typical: Photoluminescent
 - b. Obstructions: Photoluminescent and black strips
 4. Photoluminescent Pigments: Strontium Aluminate
 5. Size: 1-inch wide by 10-foot 0-inch long strips
 6. Excitation: Fluorescent lamp, 5 foot candle minimum, 60 minute
 - a. After glow luminance: $\text{mcd/m}^2 = 52 @ 90 \text{ minutes}$
 7. Warranty: Five (5) years.
- C. Compliance: Phoenix Building Construction Code.
- D. Photoluminescent Markings Schedule:
1. Handrail markings.
 2. Perimeter Demarcation options:
 - a. Floor mounted markings at landings and path of travel.
 - b. Wall mounted markings at landings and path of travel.
 3. Obstruction markings: (Alternating black and photoluminescent strips on strip)
 - a. Obstruction:
 - 1) On vertical stand pipes.
 - 2) On horizontal portions of items such as Fire hose assemblies.
 - b. Floor in front of obstruction.

4. Landing Leading Edge Marking:
 - a. As herein specified.
5. Final Exit Door Markings:
 - a. Around door opening mounted to frame.
6. Lead edge of Stair Tread Nosing Marking:
 - a. As herein specified.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer is responsible to examine conditions, under which metal stairs will be installed for compliance with manufacturer's installation requirements.

3.2 INSTALLATION

- A. General:
 1. Examine areas to receive work and verify that conditions and dimensions are correct to receive items.
 2. Do not start installation until unsatisfactory conditions have been corrected.
 3. Install work plumb, true, rigid, and neatly trimmed out.
 4. Do not tighten fastener through finish alone without spacer washers.
 5. Provide concrete inserts or predrilled expansion bolts in fastening items into concrete.
 6. Protect dissimilar metals from contact with each other or with other materials causing corrosion.
 7. Fasten work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.
 8. Use nonshrink grout mixed in accordance with manufacturer's direction for setting frames, plates, sills, bolts and similar items.
 9. Set items shown or required to be installed in sleeves with quick-setting anchor cement unless otherwise noted.
 10. Protect metal from damage to surface, profile and shape.
 11. Photoluminescent markings installed as herein noted, shown in drawings and/or herein specified.
- B. Install stairs and railings in accordance with manufacturer's instructions and approved drawings and to comply with specified performance requirements when installed.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors.
- D. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

- E. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- G. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- H. Weld connections which cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.
- I. Clean field welds, bolted connections and abraded areas and prime with same material used for shop priming.
- J. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- K. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.3 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

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6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.4 ADJUSTING AND CLEANING

- A. Touchup: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9600 "High-Performance Coatings."
- C. Painting: Cleaning and painting of metal stair system are specified in Section 09 9600 "High Performance Coating" section.
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780

3.5 SCHEDULE

- A. Stair Schedule:
 1. Refer to drawings

- END OF SECTION -

- SECTION 05 5150 -**ARCHITECTURAL METAL STAIRS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. **Stair No. 5 Grand Stair:** Architectural AESS custom steel-framed painted stairs with;
 - a. Bent plate treads and risers fabricated to form continuous assembly.
 - b. Tube steel stringers at each side of stairs and placed to side of tread/riser assembly.
 - c. Tube steel intermediate stringer placed under center of stair.
 - d. Custom bent metal stringer cladding to conceal stringer and hand railing post connection to top of stringer.
 - 1) Metal finish as indicated on Drawings.
 - e. Steel Painted with High Performance paint.
 - 1) Exposed face of risers with custom antique mirror or other finish as directed by Architect.
 - f. Solid natural stone treads and landing finish materials.
 - 1) Metal inlay at Treads, typical.
 - 2) Contrasting color inlay at landing edge in accordance with building code.
 - 3) Contrasting color inlay nosing at upper most and lowest tread of each run of stairs in accordance with building code.
 - g. Structural decorative glass railing system incorporating glass panels, Handrail posts and connection of glass panels to railing posts, refer to section 05 7300 "Decorative Metal and Glass Railings"

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 1200 "Structural Steel Framing".
- C. Section 05 1213 "Architecturally-Exposed Structural Steel (AESS) Framing".

- D. Pertinent Sections specifying Metal Framing for metal backing for anchoring railings.
- E. Section 05 7300 "Decorative Metal and Glass Railings" for railings and handrails for stairs specified under this section and other locations.
 - 1. Decorative Metal and Glass Railings attached to metal stairs specified in this section.
 - 2. Decorative Metal and Glass Railings attached to walls adjacent to metal stairs specified in this section.
- F. Section 09 6340 "Stone Flooring" for stone finish material on treads and landings.
- G. Section 09 9600 "High Performance Coatings" for 'Decorative Finish Coating' for Architectural stairs

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Standards and References: (Latest Edition unless otherwise noted)
 - 1. ASTM International, formally American Society for Testing and Materials, Specifications as listed in the Section.
 - 2. Federal Specifications (FS).
 - 3. American Institute of Steel Construction's "Specification for Structural Steel Buildings".
 - 4. American Welding Society's "Structural Welding Code" (AWS D1.1).
 - 5. American Iron and Steel Institute's "Specifications for Design of Light Gauge Cold-Formed Stainless Steel Structural Members".
 - 6. National Association of Architectural Metal Manufacturer's "Metal Stairs" (NAAMM-MS).
 - 7. Steel Structures Painting Council's "Painting Manual":
 - a. Solvent Cleaning (SSPCC-SP 1).
 - b. Hand Tool Cleaning (SSPC-SP 2)
 - c. Brush-Off Blast Cleaning (SSPC-SP 7)
 - d. Hot Phosphate Surface treatment (SSPC-PT 4).
 - 8. American Hot Dip Galvanizers Association, Inc. (AHDGA):
 - a. Inspection manual for hot dip galvanized products.

1.5 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. inches (2580 sq. mm).
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.

4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 -inch (6.4 mm), whichever is less.
- D. Structural Performance of Railings: Provide railings as specified under related Sections capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 3. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- E. Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to loads per California Building Code, 2010 Edition, including Design Story Drift Seismic Drift.
1. Coordinate with drawings; see Structural General Notes.

1.6 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
1. Paint products.
 2. Handrails
 3. Wood (solid stock) treads and landings finish
 4. Steel components
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Provide templates for anchors and bolts specified for installation under other Sections.
 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the California registered professional engineer responsible for their preparation.
 3. Show a large scale construction of various parts, methods of joining, thickness of metals, profiles of surfaces, reinforcing, anchorage, and structural supports. Include information regarding concealed and exposed joints, welds, and fastenings.
 4. Where welded connectors and concrete inserts are required to receive work, show size and locations required.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes:
1. Stair treads with contrasting code compliant inlay accent strip.

2. Glazing for railing and guardrail panels.
 - a. Refer to Section 05 7300 "Decorative Metal and Glass Railings"
3. Handrails and brackets.

1.7 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Qualification Data: For professional engineer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.
 1. Test railings according ASTM E 894 and ASTM E 935.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 1. Ornamental Stairs: Architectural class.
- C. Welding: Qualify procedures and personnel according to the following:
 1. AWS D1.1, "Structural Welding Code--Steel."
 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
- D. Design Criteria:
 1. Work shall be designed to support normally imposed loads and conform to AISC requirements.
 2. Built-up parts shall not exhibit warp.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them.
 1. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs.
 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete.
 2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General:
 - 1. Provide materials with smooth, flat surfaces, unless otherwise indicated.
 - 2. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: .
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- F. Steel Bolts, Nuts, and Washers: ASTM A307.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- I. Primer: Provide primers that comply with Section 09 9600 "High Performance Coatings".
- J. Dissimilar Materials: Separate dissimilar surfaces in contact with or in close proximity to non-compatible metals, concrete masonry, or plaster with neoprene gasket; or other approved means.
- K. Expansion Bolts: Hilti"Kwik Bolt III" Expansion Anchor Bolts, galvanized unless otherwise indicated
- L. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed elements.
- M. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).
 - 2. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
- C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Intumescent paint: Refer to Section 09 9646 "Intumescent Finishing"
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
 - 1. Refer to Section 01 6116.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding, unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
 - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. Preamsembled Stairs:
 - 1. Assemble stairs in shop to greatest extent possible.
 - 2. Disassemble units only as necessary for shipping and handling limitations.
 - 3. Clearly mark units for reassembly and coordinated installation.

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- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 -inch (1 mm), unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- F. Architectural Finish: Fabricate as Architecturally Exposed Structural Steel as specified in Section 05 1213.
 - 1. Weld exposed corners and seams continuously, unless otherwise indicated.
 - 2. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 - 2. Locate joints where least conspicuous.
- I. Fabricate joints that will be exposed to weather in a manner to exclude water.
 - 1. Provide weep holes where water may accumulate.

2.6 FABRICATED STEEL-FRAMED STAIRS

- A. Stair Framing:
 - 1. Fabricate stringers as detailed.
 - a. Provide closures for exposed ends of stringers.
 - 2. Construct platforms of steel channel and tube headers and miscellaneous framing members as needed to comply with performance requirements.
 - a. Refer also to Drawings.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
 - 4. Weld intermediate stringer to framing members and placed under stair.
- B. Wood finish Tread and Landing finish Stairs: Form risers, tread platforms, and subplatforms to configurations required to accept wood finish on treads and landings specified in related section from steel sheet of thickness needed to comply with performance requirements but not less than 0.0677 -inch (1.7 mm).
 - 1. Recess cut into underside of tread nosing for LED light fixture strip, typical.

2. Steel Sheet: Uncoated cold rolled steel sheet, unless otherwise indicated.
3. Steel Sheet: Galvanized steel sheet, at exterior locations.
4. Directly weld metal bent plate for treads and landings to stringers; locate welds on top of subreads where they will be concealed by finish treads.
 - a. Do not weld risers to stringers unless required by design.

2.7 STAIR RAILINGS AND GUARDRAILS

- A. Types specified in Section 05 7300 and as detailed on Drawings.

2.8 FINISHES

- A. Preparation of Surfaces:
 1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting.
 - a. Where hand cleaning methods are not adequate, clean in accordance with SSPC-SP 1, SSPC-SP 2, or SSPC-SP 7 as required.
 - b. Completely eliminate burrs, rough spots and pitting from normally exposed ferrous metal items.
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Finish as Architecturally Exposed Structural Steel as specified in Section 05 1213.
- D. Finish metal stairs after assembly.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
 1. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- F. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Examine areas to receive work and verify that: Setting conditions and dimensions are correct to receive items.
- B. Do not start installation until unsatisfactory conditions have been corrected.
- C. Install work plumb, true, rigid, and neatly trimmed out.

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- D. Do not tighten fastener through finish alone without spacer washers.
- E. Provide concrete inserts or predrilled expansion bolts in fastening items into concrete.
- F. Protect dissimilar metals from contact with each other or with other materials causing corrosion.
- G. Fasten work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.
- H. Use nonshrink grout mixed in accordance with manufacturer's direction for setting frames, plates, sills, bolts and similar items.
- I. Set items shown or required to be installed in sleeves with quick-setting anchor cement unless otherwise noted.
- J. Protect metal from damage to surface, profile and shape.
- K. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete inserts, through-bolts, lag bolts, and other connectors.
- L. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- M. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- N. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- O. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- P. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 ADJUSTING AND CLEANING

- A. Touchup: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

- B. Painting:
 - 1. Clean and paint metal stair system as specified in Section 09 9600 "High Performance Coatings".
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780

3.3 SCHEDULE

- A. Stair Schedule:
 - 1. **Stair No. 5:** Custom fabricated steel stair with AESS members.
 - a. Refer to 1.2 SUMMARY as specified.
 - b. Refer to Section 05 7300 "Decorative Metal and Glass Railings" for Railings and as detailed on drawings for structural glass railings and guardrails.
 - c. Refer to Section 09 6340 "Stone Flooring" for stone material for treads and landings.

- END OF SECTION -

- SECTION 05 5213 -**PIPE AND TUBE RAILINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Tube steel Roof guardrail systems.
 - a. Welded fully watertight
 - b. Galvanized coating and painted
 - 2. Guardrails where indicated in drawings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 05 0810 "Galvanized Finishes on Steel"
- D. Section 05 5100 "Pre-Fabricated Metal Stairs" for pre-fabricated metal stairs.
- E. Section 05 7300 "Decorative Metal and Glass Railings" for railings and handrails for stairs specified under this section and other locations.
- F. Section 09 9600 "High Performance Coatings" for field applied durable paint finish

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASME A17.1 Safety Code for Elevators and Escalators
- C. ASTM: Standards as herein specified in body of specification
- D. AWS D1.6 / D1.6M, "Structural Welding Code – Stainless Steel"

- E. National Ornamental & Miscellaneous Metals Association (NOMMA) Guideline 1, www.nomma.org
- F. SSNIA, Specialty Steel Industry of North America, 'Designer Handbook' for; 'Stainless Steel For Handrails, Railings & Barrier Applications', www.ssina.com

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes, including but not limited to the following;
 - 1. Steel materials
 - 2. Grout, anchoring cement, and paint products.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Samples for Verification: For each type of wood finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.

1.6 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Qualification Data: For professional engineer.
- D. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700.
 - 2. Warranty: Submit specified warranty.

PIPE AND TUBE RAILINGS

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing component through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."

1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.

2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Steel Pipe and Tube Railings:
 - a. Custom fabricated
 - b. Pisor Industries, Inc.
 - c. Sharpe Products.
 - d. Wagner, R & B, Inc.; a division of the Wagner Companies.
- B. At contractor's option: Railing systems may be fully fabricated by a qualified metal shop meeting the requirements of this section.
 1. Qualified Metal Shop: Fabricator with a minimum of seven years experience in engineering, fabricating and installing railings with an architectural exposed steel finish.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.4 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.5 FASTENERS

- A. General: Provide the following:
 1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:

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1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - a. Fully weld watertight all exterior railing assemblies.
 - b. Fully weld watertight all railing assemblies at Parking levels.
- D. Anchors: Provide cast-in-place chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
 3. Refer to and coordinate with Section 09 9600 "High Performance Coatings"
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 -inch (1 mm)**, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or non-welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- J. Form changes in direction as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
 - 2. By inserting prefabricated elbow fittings.
- K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 -inch (6 mm)** or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

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- P. For railing posts set in concrete, provide steel sleeves not less than 6 -inches (150 mm) long with inside dimensions not less than 1/2 -inch (13 mm) greater than outside dimensions of post, with steel plate forming bottom closure.
- Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate a continuous 2 -inch high by 1-1/2 -inch deep toe board along all stair landings and balcony edges.

2.8 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
 1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Railings Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. Interior Railings Indicated to Receive Zinc-Rich Primer (SSPC Zone 1A): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 -inch in 3 feet (2 mm in 1 m).
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 -inch in 12 feet (5 mm in 3 m).
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 -inches (125 mm) deep and 3/4 -inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post, attached to post with set screws, at enclosed stairwells.
- C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8 -inch (3-mm) buildup, sloped away from post.
- D. Anchor plate balusters to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- E. Coordinate mounting to roof substrate with structural drawings and roofing specification / contractor.

3.5 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2 -inch (38-mm) clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For steel-framed gypsum board partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

3.6 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Clean stainless steel in accordance with SSINA, The Stainless Steel Information Centers 'Designer Handbook; The Care and Cleaning of Stainless Steel.
- C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.7 PROTECTION

- A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished.

- END OF SECTION -

- SECTION 05 5300 -**METAL GRATINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior Stainless Steel Metal bar gratings.
 - 2. Metal frames and supports for gratings
 - a. Stainless steel
 - b. Galvanized.
 - 3. Sump Pit Grate – Elevator Pit
 - 4. Laundry Trench Grate
 - 5. Site Horizontal Grate at Emergency Generator room.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 03 3000 "Cast-In-Place Concrete".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Interior Stainless Steel Metal bar gratings.
 - 2. Metal frames and supports for gratings.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.

- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700 "Closeout Procedures"
 - 2. Warranty: Submit specified warranty.

1.7 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with;
 - 1. NAAMM MBG 531, "Metal Bar Grating Manual"
 - 2. NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.3, "Structural Welding Code - Sheet Steel."
 - 4. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

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- B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design gratings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft. (2.87 kN/sq. m).
 2. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m).
 3. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 8000 lbf (35.60 kN), whichever produces the greater stress.
 4. Limit deflection to L/240 or 1/4 inch (6.4 mm), whichever is less.
 5. Floors: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 3000 lbf (13.40 kN), whichever produces the greater stress.
- C. Seismic Performance: Provide gratings capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7 .

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- C. Wire Rod for Bar Grating Crossbars: ASTM A 510 (ASTM A 510M).
- D. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30 (Grade 205).
- E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating.
- F. Expanded-Metal Carbon Steel: ASTM F 1267, Class 1.
- G. Expanded-Metal Galvanized Steel: ASTM F 1267, Class 2, Grade A.
- H. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304 .

- I. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304 .
- J. Expanded-Metal Stainless Steel: ASTM F 1267, Class 3, made from stainless-steel sheet, ASTM A 666, Type 304 .

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless steel fasteners for fastening stainless steel.
 - 3. See also specific fasteners for grates as specified.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 2 (A4).
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- F. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- G. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.
- B. Shop Primers: Provide primers that comply with;

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1. Section 05 0810 "Galvanized Finishes on Steel"

- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
 2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
1. Products: Subject to compliance with requirements, provide one of the following :
 - a. Refer to Section 09 9600 "High -Performance Coatings" or one of the following if Section 09 9600 is not included;
 - 1) PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - 2) Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - 3) Tnemec Company, Inc.; Tneme-Zinc 90-97.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 -inch (1 mm)** unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

2.6 SITE HORIZONTAL GRATE (Emergency Generator room)

A. Manufactures:

1. Approved Manufacturers:
 - a. Pacific Grating
 - b. McNichols Co.

B. Grate:

1. Mfgr: Grating Pacific, www.gratingpacific.com
2. Type: Metal Bar Grating
3. Removable: Yes
4. Assembly: Fully welded
5. Series: Welded Heavy Duty Grating
6. Load rating: H-20 Truck
 - a. 19 Space load chart.
 - 1) http://www.gratingpacific.com/load_tables/metal_bar_gratings/heavy_duty_19_space_table.pdf
7. Material: Galvanized steel
8. Max. span: 5 -feet
9. Type: W-19-4
10. Banding: Load bearing type
11. Size:
 - a. Bearing Bars: 3 1/2 -inch by 3/8 -inch
 - b. Cross Bars: 1 -inch by 3/8 -inch
12. Spacing:
 - a. Bearing bars: 1 3/16 -inch o.c.
 - b. Cross bars: 4 -inches o.c.

C. Accessories:

1. Fasteners: (For removable option)
 - a. Welded Lug - typical
 - 1) Pre-drilled lug is shop welded between bearing bars for securing with 1/4 -inch bolts to support framing.
 - b. Saddle Clips – where Welded lugs not practical
 - 1) Pre-drilled saddle clip that sets over two bearing bars that is pre-drilled for securing with 1/4 -inch bolts to support framing.
 - c. “G” Clips – at exposed edges of beams
 - 1) Pre-drilled depress washer sets on top of bearing bars with clip that grabs edge of channel or beam flange with 1/4 -inch diameter bolt.

D. Frame:

1. Galvanized steel angle with embeds.
 - a. Refer to Structural Drawings.
2. Grate to be removable.

2.7 LAUNDRY TRENCH GRATE

- A. Type: Pressure-Locked.
- B. Material: Stainless-Steel Grating, refer to Article 2.8D
- C. Accessories:
 - 1. 1/2 -inch round steel bars for lint screen.
- D. Forming and Finishing:
 - 1. Form laundry trench using fabricated perimeter frame and concrete forms as required to depth and shape indicated.
 - 2. Set top of perimeter seat angle flush with finish floor, allowing for thickness of finish material.

2.8 METAL BAR GRATINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alabama Metal Industries Corporation; a Gibraltar Industries company(AMICO), www.amico-online.com
 - 2. All American Grating, www.aagrating.com
 - 3. BarnettBates Corporation, www.barnettbates.com
 - 4. Fisher & Ludlow; Division of Harris Steel Limited, www.fischerludlow.com
 - 5. Grating Pacific, Inc, www.gratingpacific.com
 - 6. IKG Industries; a division of Harsco Corporation, www.harscoikg.com
 - 7. Marwas Steel Co.; Laurel Steel Products Division (MLP Steel) www.marwas.com
 - 8. Seidelhuber Metal Products; Division of Brodhead Steel Products, www.seidelhubermetal.com
- B. Pressure-Locked Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars (Dovetail)
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Grating Pacific**, www.gratingpacific.com, **Bar Grating**, or comparable product by an alternate manufacturer as herein specified.
 - a. Grating Mark PD-15-4 (1 x 3/16)
 - 1) Material: STAINLESS STEEL:
 - 2) Spacing: 1-inch by 3/16 -inch (25 mm by 4.8 mm) bearing bars at 11/16 - inch (18 mm) o.c., and crossbars at 2 -inches (51 mm) o.c.
 - 3) Type: 11-4
 - 2. Traffic Surface: Plain
 - 3. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface.
- C. Pressure-Locked, Stainless-Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars (Dovetail).

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Grating Pacific**, www.gratingpacific.com, **Bar Grating**, or comparable product by an alternate manufacturer as herein specified.
 - a. Grating Mark PD-15-4 (1-1/4 x 3/16)
 - 1) Material: STAINLESS STEEL:
 - 2) Spacing: 1 1/4-inch by 3/16 -inch (32 mm by 4.8 mm) bearing bars at 11/16 -inch (18 mm) o.c., and crossbars at 4 -inches (102 mm) o.c.
 - 3) Type: 11-4
 2. Traffic Surface:
 - a. Plain
 3. Finish:
 - a. Mill finish
 4. Banded: Yes
 - a. Fully welded Trim banding with a flat bar to form perimeter frame
- D. Pressure-Locked, Stainless-Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars (Dovetail).
1. Basis-of-Design Product: Subject to compliance with requirements, provide **Grating Pacific**, www.gratingpacific.com, **Bar Grating**, or comparable product by an alternate manufacturer as herein specified.
 - a. Grating Mark PD-15-4 (1-1/4 x 3/16)
 - 1) Material: STAINLESS STEEL:
 - 2) Spacing: 1 1/4-inch by 3/16 -inch (32 mm by 4.8 mm) bearing bars at 11/16 -inch (18 mm) o.c., and crossbars at 4 -inches (102 mm) o.c.
 - 3) Type: 11-4
 2. Traffic Surface:
 - a. Plain
 3. Finish:
 - a. Mill finish
 4. Banded: Yes
 - a. Fully welded Trim banding with a flat bar

2.9 GRATING FRAMES AND SUPPORTS

- A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Unless otherwise indicated, fabricate from same basic metal as gratings.
 2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 -inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 -inches (32 mm) wide by 1/4 -inch (6 mm) thick by 8 -inches (200 mm) long.
 3. Basis of Design:
 - a. Stainless Steel Grate:
 - 1) Application:
 - a) Where indicated.

METAL GRATINGS

- 2) Pacific Grating, www.pacificgrating.com Type "M" Cast-in-place frame in stainless steel mill finish or frame supplied by approved alternate grate manufacturer.
- b. Galvanized Steel Grate:
 - 1) Application:
 - a) Where indicated.
 - b) Elevator Pit Sump Pit
 - 2) Galvanized Steel angles.
 - a) Pacific Grating, www.pacificgrating.com Type "E-Z" Cast-in-place frame in stainless steel mill finish or frame supplied by approved alternate grate manufacturer.

2.10 STEEL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish gratings, frames, and supports after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

3.2 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of galvanized finishes, shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum **2.0-mil (0.05-mm)** dry film thickness.
 - 2. Refer to Section 05 0810 "Galvanized Finishing on Steel"
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in;
 - 1. Section 05 0810 "Galvanized Finishing on Steel" for field touch up of grate frames.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

- END OF SECTION -

- SECTION 05 7000 -

DECORATIVE METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Decorative metal panels for;
 - a. As indicated on Drawings
 - b. Decorative metal Flue Cover for fireplace Flue (Section 10 3100)
 - c. Decorative metal Enclosure Box for fireplace box (Section 10 3100)
 - d. Decorative metal cladding for stair stringer. (Section 05 5150)
 - e. Decorative metal components for Grand Stair

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 05 4000 "Cold-Formed Metal Framing"
- E. Section 05 5000 "Metal Fabrications" for non-decorative metal fabrications.
- F. Section 06 2023 "Interior Finish Carpentry"
- G. Section 06 4023 "Interior Architectural Woodwork"
- H. Section 10 3100 "Manufactured Fireplaces" for decorative flue cover requirements.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.5 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 3300 "Submittal Procedures".
- B. Product Data: For each type of product indicated, including finishing materials.
- C. Shop Drawings: Show fabrication and installation details for decorative metal.
 - 1. Include plans, elevations, component details, and attachments to other work.
 - 2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
 - 3. Include cross reference to specific specification section work decorative metal is being provided for.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design including mechanical finishes.
- E. Samples for Verification: For each type of exposed finish required.
 - 1. Minimum 8 -inch by 10 -inch.
 - 2. 6 -inch long round decorative flue cover for fireplace
 - 3. Samples of welded and brazed joints showing quality of workmanship and color matching of materials.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator, organic-coating applicator, anodic finisher and powder-coating applicator as applicable.
- B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- C. Welding certificates.

1.7 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Installer Qualifications: Fabricator of decorative metal products.
- C. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings, of type indicated, to aluminum extrusions and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- D. Anodic Finisher Qualifications: A firm experienced in successfully applying anodic finishes of type indicated and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- E. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 4. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups for the following types of decorative metal:
 - a. Coordinate mockups when decorative metal is an accessory component of an assembly.
 - b. Elevator Door Panels with custom etched design.
 - c. Flue Cover.
 - d. Fireplace Box Enclosure.
- H. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- B. Deliver decorative metal to contractor when installation of material will be done under a different scope of work.

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Deliver and store materials under temperature and humidity conditions recommended by the manufacturer.
 - 1. Protect from excessive heat and humidity.

1.11 COORDINATION

- A. Coordinate installation of anchorages for decorative metal items.
 - 1. Furnish setting drawings, templates, and directions for installing decorative metal panels into other work.
 - 2. Deliver items to Project site in time for installation or as required to fabrication shops fabricating items such as millwork for delivery to site.
 - 3. Coordinate Fireplace Decorative Box Enclosure with framed and sheathed enclosure around fire place and placement within the Storefront framing.
 - 4. Coordinate cladding extent, dimensions, etc. with stair monumental stair design.
 - a. Refer to, but not limited to; 19/A7.11 & 29/A7.11

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Provide products with highest levels of post-consumer and pre-consumer recycled content.

2.2 METALS - GENERAL

- A. Metal Surfaces, General:
 - 1. Provide materials with smooth, flat surfaces unless otherwise indicated.
 - 2. Provide materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Refer to drawings for applications, finish, color, texture, etc. unless herein indicated otherwise.
- C. Refer to other associated project Specifications for applications requiring Decorative Metal as herein specified.

2.3 METALS - ALUMINUM

- A. Fabricate products from alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Bars and Shapes: **ASTM B 221** (**ASTM B 221M**), Alloy 6063-T5/T52.
- C. Pipe and Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
- D. Tubing: **ASTM B 210** (**ASTM B 210M**), Alloy 6063-T832.
- E. Plate and Sheet: **ASTM B 209** (**ASTM B 209M**):
 - 1. Formed metal that will be painted or finished with PVDF: Alloy 3003-H14
 - 2. Material that will be anodized: Alloy 5005-H32
 - 3. High strength flat applications which are not anodized finish: Alloy 6061-T6].
- F. Forgings: **ASTM B 247** (**ASTM B 247M**), Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.4 MATERIAL - COPPER ALLOYS

- A. Copper and Copper Alloys, General: Provide alloys indicated and temper to suit application and forming methods but with strength and stiffness not less than H01 (quarter-hard) for plate, sheet, strip, and bars and H55 (light-drawn) for tube and pipe.
- B. Tube: ASTM B 75/B 75M, Alloy UNS C12200 (phosphorous deoxidized, high residual phosphorous copper).
- C. Castings: ASTM B 824, with a minimum of 99.9 percent copper.
- D. Plate, Sheet, Strip, and Bars: ASTM B 152/B 152M, Alloy UNS C11000 (electrolytic tough pitch copper) or Alloy UNS C12200 (phosphorous deoxidized, high-residual phosphorous copper).

2.5 BRONZE

- A. Extruded Shapes: ASTM B 455, Alloy UNS C38500 (architectural bronze).
- B. Pipe: ASTM B 43, Alloy UNS C23000 (red brass, 85 percent copper).
- C. Tube: **ASTM B 135** (**ASTM B 135M**), Alloy UNS C23000 (red brass, 85 percent copper).
- D. Castings:
 - 1. ASTM B 62, Alloy UNS C83600 (85-5-5-5 or
 - 2. No. 1 composition commercial red brass) or
 - 3. ASTM B 584, Alloy UNS C86500 (No. 1 manganese bronze).

- E. Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS C28000 (muntz metal, 60 percent copper).
- F. Natural color:
 - 1. Antique where indicated.
 - 2. Darker in color than brass, similar to "Architectural Bronze"

2.6 BRASS

- A. Brass Alloy 220 (Commercial Bronze): Gage Architectural Metals; www.gagecorp.net.
 - 1. Thickness: 18 gauge (0.050 -inch or 1.20 mm).
 - 2. Peel Coating (remove after final acceptance): Thickness 0.004 -inches, (0.10 mm) minimum.
 - 3. Flame Spread / Smoke Developed: ASTM E84 Class A.
 - 4. Clear Lacquer coating: Clear, acrylic lacquer specially developed for coating copper-alloy products.
- B. Extruded Shapes: ASTM B 249/B 249M, Alloy UNS C36000 (free-cutting brass).
- C. Seamless Tube: ASTM B 135 (ASTM B 135M), Alloy UNS C26000 (cartridge brass, 70 percent copper).
- D. Castings: ASTM B 584, Alloy UNS C85200 (high-copper yellow brass).
- E. Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS C26000 (cartridge brass, 70 percent copper).
- F. Natural color: Brassy-yellow color.

2.7 NICKEL SILVER

- A. Extruded Shapes: ASTM B 249/B 249M, Alloy UNS C79600.
- B. Castings: ASTM B 584, Alloy UNS C97300 (12 percent leaded nickel silver).
- C. Natural color: Silvery gold to white.

2.8 STAINLESS STEEL

- A. Tubing: ASTM A 554,
 - 1. Typical, uno:
 - a. Grade MT 304
 - 2. Interior swimming pool area's:
 - a. Typical, uno: Grade MT 316
 - b. Welded conditions: Grade MT 316L.
 - 3. Exterior conditions:
 - a. Typical, uno: Grade MT 316

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b. Welded conditions: Grade MT 316L.

B. Pipe: ASTM A 312/A 312M:

1. TP Grade and type to match Tubing.

C. Castings: ASTM A 743/A 743M:

1. CF Grade and type to match Tubing.

D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666:

1. Grade and type to match Tubing.

E. Bars and Shapes: ASTM A 276

1. Grade and type to match Tubing.

F. Wire Rope and Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cable Connection (The).

b. Carl Stahl Décor Cable, Inc.

c. Esmet, Inc.

d. Feeney Wire Rope & Rigging.

e. Hayn Enterprises, LLC.

f. Johnson, C. Sherman, Co., Inc.

g. Loos & Co., Inc.

h. Secosouth, Inc.

2. Finish / Pattern: Bright

2.9 STEEL AND IRON

A. Tubing:

1. Cold formed: ASTM A 500/A 500M.

2. Mandrel drawn: ASTM A 513, Type 5.

B. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M unless otherwise indicated.

E. Steel Sheet, Cold Rolled: ASTM A 1008/A 1008M, either commercial steel or structural steel, exposed.

2.10 TITANIUM

A. Strip, Sheet, and Plate: ASTM B 265, Grade 1.

- B. Bars: ASTM B 348, Grade 1.

2.11 ETCHED DECORATIVE DESIGN

- A. Acid Etched Design:
1. Evenly applied.
 2. Pattern to be Original art, provided by Interior Design via Architect in AutoCAD or other compatible file format.

2.12 DECORATIVE COVER FOR FIREPLACE VENT FLUE

- A. Material: Aluminum
- B. Gauge: 14 gauge:
- C. Finish:
1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 2. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- D. Color: Match Aluminum –Framed Storefront
1. Refer to Drawings.
 2. Refer to Section 08 4114 "Interior Aluminum Framed Entrances and Storefront"
- E. Assembly:
1. Formed tubular shape:
 - a. Length to be 2 –inches greater than bottom of finish ceiling/soffit unless indicated otherwise on Drawings.
 - b. Length to extend to top of fireplace box through the decorative Fireplace Box Enclosure unless indicated otherwise on Drawings
 2. Seam: Overlapping joint for butt joint.
 - a. Set seam at side facing window vertical mullion.
 3. Fasteners: Rivets at 4 –inches o.c.

2.13 DECORATIVE FIREPLACE BOX ENCLOSURE CLADDING

- A. Material: Aluminum
- B. Gauge: 14 gauge:
- C. Finish:
1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

D. Color: Match Aluminum –Framed Storefront

1. Refer to Drawings.

E. Assembly:

1. Formed rectangular cladding shapes in sizes to enclose framed and sheathed fireplace fire-box as indicated on Drawings.
 - a. Top enclosure cladding shall be made from a single sheet with tight bent edges and welded vertical joints.
 - 1) Cladding shall continue into fireplace opening and continue to face of glass frame/trim.
 - b. Bottom enclosure cladding shall be made from a single sheet with tight bent edges and welded vertical joints.
 - 1) Cladding shall continue into fireplace opening and continue to face of glass frame/trim.
2. Seams: Welded smooth and match bent edges
3. Fastening: Adhere to substrate with Liquid nails, product type approved for both substrates.

2.14 DECORATIVE MONUMENTAL STAIR STRINGER CLADDING

A. Material: Steel

B. Gauge: 14 gauge:

C. Finish:

1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

D. Color: Match railing posts

1. Refer to Drawings.
2. Refer to Section 05 7300.

E. Assembly:

1. Formed rectangular cladding shape in two pieces to enclose stair stringer and as indicated on Drawings.
 - a. Cladding shall be made from a single sheet as much as possible with tight bent edges and welded joints.
 - 1) Any separate pieces of assembly shall also be fully welded and ground smooth for seamless smooth finish.

2. Seams: Welded smooth and match bent edges.
 - a. NOMMA Finish #1 or equivalent, www.nomma.org
3. Fastening: Adhere to substrate and clips with two sided 3M adhesive tape, concealed fasteners and rivets as approved during shop drawings review.
 - a. Tape:
 - 1) Mfgr: 3M.
 - 2) Website: http://solutions.3m.com/wps/portal/3M/en_US/Adhesives/Tapes/Products/~//3M-VHB-Tape-4979?N=5000130+3294314429&rt=rud
 - 3) Type: Two sided Multi-Purpose Acrylic adhesive
 - 4) Material: Closed cell acrylic foam tape with PE film liner
 - 5) Thickness: 2.0mm (.080 –inches)
 - 6) Width: 0.75 –inches, typical.
 - a) 0.5 –inches for return legs where 0.75 –inch is two wide.

2.15 DECORATIVE MONUMENTAL STAIR METAL

- A. Drawing Designation: “MT-1”
- B. Material: Bronze
- C. Gauge: 14 gauge or heavier, refer to Drawings
- D. Finish:
 1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 2. Antique
- E. Assembly:
 1. Formed as indicated on Drawings.
 - a. Cladding shall be made from a single sheet as much as possible with tight bent edges and welded joints.
 - 1) Any separate pieces of assembly shall also be fully welded and ground smooth for seamless smooth finish.
 2. Seams: Welded smooth and match bent edges.
 - a. NOMMA Finish #1 or equivalent, www.nomma.org
 3. Fastening: Adhere to substrate and clips with two sided 3M adhesive tape, concealed fasteners and rivets as approved during shop drawings review.
 - a. Tape:
 - 1) Mfgr: 3M.
 - 2) Website: http://solutions.3m.com/wps/portal/3M/en_US/Adhesives/Tapes/Products/~//3M-VHB-Tape-4979?N=5000130+3294314429&rt=rud
 - 3) Type: Two sided Multi-Purpose Acrylic adhesive
 - 4) Material: Closed cell acrylic foam tape with PE film liner
 - 5) Thickness: 2.0mm (.080 –inches)

- 6) Width: 0.75 –inches, typical.
a) 0.5 –inches for return legs where 0.75 –inch is two wide.

2.16 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
1. Aluminum Items:
 - a. Typical, uno: Type 316 stainless-steel fasteners.
 - 1) Stainless steel rivets at decorative vent flue cover
 - b. Painted conditions: Aluminum fasteners.
 2. Copper-Alloy (Bronze) Items:
 - a. Concealed conditions: Silicon bronze (Alloy 651 or Alloy 655)
 - b. Exposed conditions: Muntz metal (Alloy 280)
 3. Copper-Alloy (Brass) Items:
 - a. Concealed conditions: Silicon bronze (Alloy 651 or Alloy 655)
 - b. Exposed conditions: Brass (Alloy 260 or 360)
 4. Stainless-Steel Items:
 - a. Stainless steel fasteners to match substrate type
 5. Titanium Items: Type 316 stainless-steel.
 6. Uncoated-Steel Items:
 - a. Concealed conditions: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 - b. Exposed conditions: Type 304 stainless-steel.
 7. Galvanized-Steel Items: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 8. Dissimilar Metals: Type 316 stainless-steel.
- B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.
- C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.
1. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on:
1. Mechanical anchors: ICC-ES AC193.
 2. Adhesive anchorage: ICC-ES AC308.
 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 unless otherwise indicated.
 4. Material for Exterior Locations and Where Stainless Steel Is Indicated: AlloyGroup 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.17 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For specific metal alloy, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Brazing Rods: For specific metal alloy, provide type and alloy as recommended by producer of metal to be brazed and as required for color match, strength, and compatibility in fabricated items.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Shop Primers: Provide primers that comply with;
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
 - 2. Section 099600 "High-Performance Coatings."
- E. Universal Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
 - 2. Refer to Section 05 0810 "Galvanized Finishes on Steel"
 - 3. Refer to Section 099600 "High-Performance Coatings."
- F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
 - 2. Refer to Section 099600 "High-Performance Coatings."
- G. Shop Primer for Galvanized Steel:
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
 - 2. Refer to Section 09 9600 "High-Performance Coatings"
- H. Galvanizing Repair Paint:
 - 1. Refer to Section 05 0810 "Galvanized Finishes on Steel"
- I. Intermediate paint Coats for Steel:
 - 1. Refer to Section 09 9600 "High-Performance Coatings"
- J. Clear protective coatings:
 - 1. Type: Clear, epoxy lacquer specially developed for coating listed metal products.
 - 2. Substrates:
 - a. Copper alloys
 - b. Bronze
 - c. Brass
 - d. Steel
 - e. Stainless steel
 - 3. Refer to Section 09 9600 "High-Performance Coatings"
- K. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

DECORATIVE METAL

L. Two-Side Tape:

1. Adhere to substrate and clips with two sided 3M adhesive tape.

a. Tape:

- 1) Mfgr: 3M.
- 2) Website:
http://solutions.3m.com/wps/portal/3M/en_US/Adhesives/Tapes/Products/~//3M-VHB-Tape-4979?N=5000130+3294314429&rt=rud
- 3) Type: Two sided Multi-Purpose Acrylic adhesive
- 4) Material: Closed cell acrylic foam tape with PE film liner
- 5) Thickness: 2.0mm (.080 -inches) or as required for application.
- 6) Width: 0.75 -inches, typical.

2.18 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish / Pattern:
 1. Refer to Drawings
 2. As herein specified

2.19 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Application: Refer to Drawings for specific locations, color and finish type(s).
- C. Clear Anodic Finish: AAMA 611: AA-M12C22A31, Class II, 0.010 mm or thicker.
- D. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 1. Color:
 - a. As indicated on Drawings and if not,
 - b. Match Architect's sample
- E. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss:
 - a. As indicated on Drawings and if not,
 - b. Match Architect's sample

- F. Siliconized Polyester Finish: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 - 1. Color and Gloss:
 - a. As indicated on Drawings and if not,
 - b. Match Architect's sample
- G. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color and gloss>.

2.20 COPPER-ALLOY FINISHES

- A. Finish designations for copper alloys comply with the system established for designating copper-alloy finish systems defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."
- B. Application: Refer to Drawings for specific locations and finishes.
- C. Buffed Finish: M21 (Mechanical Finish: buffed, smooth specular).
- D. Hand-Rubbed Finish: M31-M34 (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed).
- E. Medium-Satin Finish: M32 (Mechanical Finish: directionally textured, medium satin).
- F. Fine-Matte Finish: M42 (Mechanical Finish: nondirectional finish, fine matte).
- G. Buffed Finish, Lacquered: M21-O6x (Mechanical Finish: buffed, smooth specular; Coating: clear, organic, air dried, as specified below):
 - 1. Clear, Organic Coating: Lacquer specified for copper alloys; applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).
- H. Hand-Rubbed Finish, Lacquered: M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear, organic, air dried, as specified below):
 - 1. Clear, Organic Coating: Lacquer specified for copper alloys; applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).
- I. Medium-Satin Finish, Lacquered: M32-O6x (Mechanical Finish: directionally textured, medium satin; Coating: clear, organic, air dried, as specified below):
 - 1. Clear, Organic Coating: Lacquer specified for copper alloys; applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

DECORATIVE METAL

- J. Fine-Matte Finish, Lacquered: M42-O6x (Mechanical Finish: nondirectional finish, fine matte; Coating: clear, organic, air dried, as specified below):
 - 1. Clear, Organic Coating: Lacquer specified for copper alloys; applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of **1 mil (0.025 mm)**.
- K. Statuary Conversion Coating over Satin Finish: M31-C55 (Mechanical Finish: directionally textured, fine satin; Chemical Finish: conversion coating, sulfide), with color matching Architect's sample.
- L. Patina Conversion Coating: M36-C12-C52 (Mechanical Finish: directionally textured, uniform; Chemical Finish: nonetched cleaned, degreased; Chemical Finish: conversion coating, ammonium sulfate), with color matching Architect's sample.
- M. Statuary Conversion Coating, Bright Relieved and Lacquered: M12-C55-M2x-O6x (Mechanical Finish: matte finish, as cast; Chemical Finish: conversion coating, sulfide; Mechanical Finish: buffed, as specified; Coating: clear, organic, air drying, as specified below), with color matching Architect's sample:
 - 1. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of **1 mil (0.025 mm)**.
- N. Blackened and Lacquered:
 - 1. As herein specified, refer to Article heading "BLACKENING SOLUTION FOR METAL SUBSTRATES"
- O. Verdigris Green Patina, and Lacquered:
 - 1. As herein specified, refer to Article heading "VERDIGRIS GREEN PATINA SOLUTION FOR METAL SUBSTRATES"
- P. Wax Polish:
 - 1. As herein specified, refer to Article heading "WAX POLISH FOR METAL SUBSTRATES"

2.21 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Application: Refer to Drawings for specific locations and finishes.
- C. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
- D. Bright, Cold-Rolled, Unpolished Finish: No. 2B.
- E. Directional Satin Finish: No. 4.
- F. Dull Satin Finish: No. 6.
- G. Reflective, Directional Polish: No. 7.
- H. Mirrorlike Reflective, Nondirectional Polish: No. 8.

- I. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- J. Sputter-Coated Finish: Titanium nitride coating deposited by magnetic sputter-coating process over indicated mechanical finish.
- K. Colored, Oxide-Film Finish: Clear, oxide interference film produced by degreasing and then immersing in a mixture of chromic and sulfuric acids.
 - 1. Product: Subject to compliance with requirements, provide INCO colored stainless-steel finish as developed and licensed by International Nickel Co., Ltd.
- L. Blackened and Lacquered:
 - 1. As herein specified, refer to Article heading "BLACKENING SOLUTION FOR METAL SUBSTRATES"
- M. Verdigris Green Patina, and Lacquered:
 - 1. As herein specified, refer to Article heading "VERDIGRIS GREEN PATINA SOLUTION FOR METAL SUBSTRATES"
- N. Wax Polish:
 - 1. As herein specified, refer to Article heading "WAX POLISH FOR METAL SUBSTRATES"

2.22 STEEL AND IRON FINISHES

- A. Application: Refer to Drawings for specific locations and finishes.
- B. Galvanizing: Hot-dip galvanize products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips indicated to be galvanized to comply with ASTM A 123/A 123M.
 - 1. Hot-dip galvanize steel and iron hardware indicated to be galvanized to comply with ASTM A 153/A 153M.
 - 2. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparing Galvanized Items for Shop Priming: After galvanizing, thoroughly clean decorative metal of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
- E. Primer Application: Apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Shop prime uncoated ferrous-metal surfaces with primers specified in Section 099600 "High-Performance Coatings" are indicated.

DECORATIVE METAL

2. Do not apply primer to galvanized surfaces.
- F. Shop-Painted Finish: Comply with Section 099600 "High-Performance Coatings."
1. Color:
 - a. As indicated in Drawings or
 - b. As indicated by manufacturer's designations or
 - c. Match Architect's sample or
 - d. As selected by Architect from manufacturer's full range
- G. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
1. Color:
 - a. As indicated in Drawings or
 - b. As indicated by manufacturer's designations or
 - c. Match Architect's sample or
 - d. As selected by Architect from manufacturer's full range
- H. Powder-Coat Finish: Prepare, treat, and coat nongalvanized ferrous metal to comply with resin manufacturer's written instructions and as follows:
1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Treat prepared metal with iron-phosphate pretreatment, rinse, and seal surfaces.
 3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm).
 4. Color:
 - a. As indicated in Drawings or
 - b. As indicated by manufacturer's designations or
 - c. Match Architect's sample or
 - d. As selected by Architect from manufacturer's full range
- I. Powder-Coat Finish: Prepare, treat, and coat galvanized metal to comply with resin manufacturer's written instructions and as follows:
1. Prepare galvanized metal by thoroughly removing grease, dirt, oil, flux, and other foreign matter.
 2. Treat prepared metal with zinc-phosphate pretreatment, rinse, and seal surfaces.
 3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm).
 4. Color:
 - a. As indicated in Drawings or
 - b. As indicated by manufacturer's designations or
 - c. Match Architect's sample or
 - d. As selected by Architect from manufacturer's full range
- J. Blackened and Lacquered:

1. As herein specified, refer to Article heading "BLACKENING SOLUTION FOR METAL SUBSTRATES"
- K. Verdigris Green Patina, and Lacquered:
 1. As herein specified, refer to Article heading "VERDIGRIS GREEN PATINA SOLUTION FOR METAL SUBSTRATES"
- L. Wax Polish:
 1. As herein specified, refer to Article heading "WAX POLISH FOR METAL SUBSTRATES"

2.23 TITANIUM FINISHES

- A. General: Fabricate items from finished titanium stock, taking care not to damage finish during fabrication. Protect finish as needed during fabrication by applying a strippable, temporary protective covering.
- B. Application: Refer to Drawings for specific locations and finishes.
- C. Dull Matte Finish: Pickled and annealed.
- D. Bright Matte Finish: Vacuum annealed.

2.24 GALVANIZED STEEL

- A. Materials designated to be galvanized steel and not painted shall be left unfinished.
- B. Refer to Section 05 0810 "Galvanized Finishes on Steel" for requirements.
- C. Finish: Natural

2.25 ZINC COATED STEEL

- A. Materials designated to be zinc coated material and not painted shall be left unfinished.
- B. Refer to Section 05 0810 "Galvanized Finishes on Steel" for requirements.
- C. Finish: Natural

2.26 FABRICATION, GENERAL

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly.
 1. Disassemble units only as necessary for shipping and handling limitations.
 2. Clearly mark units for reassembly and coordinated installation.
 3. Use connections that maintain structural value of joined pieces
- B. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged.

DECORATIVE METAL

1. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes.
 2. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- C. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces.
1. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- E. Cut, drill, and punch metals cleanly and accurately.
1. Remove burrs and ease edges to a radius of approximately $\frac{1}{32}$ -inch (1 mm) unless otherwise indicated.
 2. Remove sharp or rough areas on exposed surfaces.
- F. Mill joints to a tight, hairline fit.
1. Cope or miter corner joints.
 2. Fabricate connections that will be exposed to weather in a manner to exclude water.
- G. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work.
1. Cut, reinforce, drill, and tap as needed to receive finish hardware, screws, and similar items unless otherwise indicated.
- H. Comply with AWS for recommended practices in shop welding and brazing. Weld and braze behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
1. Where welding and brazing cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: no evidence of a welded joint .
- I. Provide castings that are sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

2.27 BLACKENING SOLUTION FOR METAL SUBSTRATES

- A. Substrates:
1. Copper
 2. Brass
 3. Bronze
 4. Steel
 5. Stainless steel
- B. Manufacturer: 2K Technologies, www.2Ktech.net
- C. Products:

1. Cleaner: 2K EcoBright Cleaner in accordance with manufacturer's written instructions.
2. Blackening Solution:
 - a. Copper: 2K Antique Black Patina for steel
 - b. Brass: 2K Antique Black Patina for steel
 - c. Bronze: 2K Antique Black Patina for steel
 - d. Steel: 2K Antique Black Patina for steel
 - e. Stainless steel: 2K Antique Black Patina for steel
 - f. Aluminum: 2K Blackening Solution for Aluminum
3. Topcoat: Yes, Clear epoxy lacquer

2.28 VERDIGRIS GREEN PATINA SOLUTION FOR METAL SUBSTRATES

- A. Substrates:
 1. Copper
 2. Brass
 3. Bronze
 4. Steel
 5. Stainless steel
 6. Over 2K Antique Black Patina surface
- B. Manufacturer: 2K Technologies, www.2Ktech.net
- C. Products:
 1. Cleaner:
 - a. Untreated metal substrate: 2K EcoBright Cleaner
 - b. Previously blackened with 2K solution: Clean per manufacturer's written instructions.
 2. Solution: 2K Verdigris Green Patina Solution:
- D. Topcoat: Yes, Clear epoxy lacquer

2.29 WAX POLISH FOR METAL SUBSTRATES

- A. Substrates: All metal types
- B. Manufacturer: 2K Technologies, www.2Ktech.net
- C. Products:
 1. Cleaner: 2K EcoBright Cleaner in accordance with manufacturer's written instructions.
 2. Wax: 2K Micro-Crystalline Wax Polish:
- D. Topcoat: Yes, Clear epoxy lacquer

2.30 METAL REVEALS

- A. Fabricate metal reveals for wood paneling from;
 - 1. Materials – refer to Drawings:
 - a. 3/4-inch by 3/4-inch by 1/16 -inch (19-by-19-by-3-mm) extruded-bronze
 - b. 3/4-inch by 3/4-inch by 0.025-inch (19-by-19-by-0.6-mm) brake-formed, stainless-steel
 - c. 3/4-inch by 3/4-inch by -0.015-inch (19-by-19-by-0.4-mm) brake-formed titanium channels.
 - 2. Drill for mounting screws 6 -inches (150 mm) from ends of channels and not more than 24 -inches (600 mm) o.c.
 - a. Locate mounting screws at same heights for all channels.
 - b. Provide color matching to reveal hex-socket, wafer-head screws for mounting reveals.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.
- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.
- D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- E. Install concealed gaskets, joint fillers, insulation, and flashings as work progresses.
- F. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.

1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.
- G. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections in "Fabrication, General" Article. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- H. Field Brazing: Comply with requirements for brazing and for finishing brazed connections in "Fabrication, General" Article. Braze connections that are not to be left as exposed joints but cannot be shop brazed because of shipping size limitations.
- I. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING DECORATIVE-METAL-CLAD, ELEVATOR DOORS AND FRAMES

- A. Install doors and frames to comply with requirements specified in Section 14 2150 "Electric Traction Passenger Elevators."
- B. Bonded metal material for doors as specified in Section 08 1200 "Bonded Metal Doors"

3.4 INSTALLING METAL REVEALS AT WOOD PANELING

- A. Install metal reveals between wood panels as paneling is installed. Secure to wood grounds with specified screws.

3.5 CLEANING AND PROTECTION

- A. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.
- C. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
- D. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- E. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

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- F. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- G. Specialty finishes on metal substrates such as; Blackened, Verdigris Green Patina, and Wax Polish:
 - 1. Comply with product manufacturers written instructions"
- H. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.
- I. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- J. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

- END OF SECTION -

- SECTION 05 7300 -**DECORATIVE METAL AND GLASS RAILINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Special Provisions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Tempered glass Railing panels & Guardrail assembly with top Rail.
 - 2. Handrail Post and handrail system, custom modified post length with all spider fittings.
 - 3. Fixed fittings to secure glass to posts.

1.3 RELATED SECTIONS

- A. Section 05 5213 "Pipe and Tube Railings" for railings fabricated from pipe and tube components.
- B. Section 05 5150 "Architectural Metal Stairs"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM A 666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM B 633 – Standard Specification for Normalized High-Strength Low-Alloy Structural Steel Plates.
- D. ASTM C 595 – Standard Specification for Blended Hydraulic Cements.
- E. ASTM C 1172 – Standard Specification for Laminated Architectural Flat Glass.
- F. ASTM E 488 – Standard Test Method for Strength of Anchors in Concrete and Masonry Element.
- G. AWS D1.1 – Structural Welding Code-Steel.

- H. SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
- I. ASTM E985 and ISO/TC 59 for railing related items apply to this section.

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.
 - d. Glass infill:
 - 1) Comply with "California Building Code (CBC)", International Building Code 2009, with 2010 California Amendments, California Code of Regulations, Title 24, Part 2. including, but not limited to;
 - a) Safety Glazing: Chapter 24 and Section 2406
 - b) Glass in Handrails and Guards: Chapter 24 & Section 2407
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- C. Railings shall meet or exceed the requirements of all applicable building codes.
- D. Railings shall have high strength stainless steel in order to comply with 1.41 with adequate safety margin.
- E. Structural glass panels shall be monolithic fully tempered;
1/2 -inch thick with a cap rail. All internal members shall be Stainless Steel or Aluminum to eliminate the possibility of rust.
- G. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.6 SUBMITTALS

- A. Product Data: For glass railing system components, glazing, posts and fittings, handrails, handrail brackets and other products to be supplied.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

DECORATIVE METAL AND GLASS RAILINGS

1. Layout of glass panels with vertical joints all indicated and dimensioned.
 2. Layout elevations of posts, fittings, railings and guardrail panels with all hole locations indicated.
 3. Layout of handrails with posts and all brackets indicated and dimensioned.
 4. Layout of Base Shoes with fastening types and locations fully dimensioned.
 5. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by;
 - a. Civil engineer licensed in the State of Arizona responsible for their preparation.
- C. Samples for Verification:
1. Glass
 2. Post
 3. Handrails
 4. Top rail
 5. Fittings and brackets.
- D. Mill Certificates: Signed by manufacturers of aluminum and stainless-steel products certifying that products furnished comply with requirements.
- E. Welding certificates.
- F. Qualification Data: For civil engineer.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing component through one source from a single manufacturer.
- B. Execution tolerance plus/minus 5/64 -inch (2 mm).
- C. Welding: Qualify procedures and personnel according to the following:
 1. AWS D1.1, "Structural Welding Code-Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.8 STORAGE

- A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind.
- B. Materials must be kept in original packing until installation.
- C. Materials to be stored at not lower than 40°F (-40°C) or higher than 212°F (100°C).

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 GLASS STRUCTURAL RAILING SYSTEM

- A. Basis-of-Design:
 - 1. CRL P5 Series Post Railing System utilizing Tempered glazing with top cap, Handrail posts with fittings and handrails, glazing panels with Cap rail as manufactured by C.R. Laurence, www.crlaurence.com
- B. Acceptable Alternate Manufacturers for Tempered Glass Railing Assemblies when they meet all design requirements shall be:
 - 1. Refer to Section 01 2500
- C. Posts:
 - 1. System: CRL Post Railing Systems
 - 2. Assembly: P5 Series Post Railing Kits
 - 3. Model: P536
 - a. 180 degree center posts
 - b. Left End posts
 - c. Right End posts
 - 4. Material:
 - a. Stainless steel
 - 5. Finish:
 - a. Polished or satin as selected by Architect.
 - 6. Size:
 - a. Custom length
 - 1) Length taken out of bottom portion of standard length
 - 7. Accessories:
 - a. Integral railing saddle for handrail in shape / profile to accommodate handrail configuration.

DECORATIVE METAL AND GLASS RAILINGS

- b. Integral base plate welded to post
- c. Base flange cover

D. Glass attachment fitting/bracket:

1. System: CRL Post Railing Systems
2. Assembly: CRL Double Arm Glass Fittings for Flat or Round surface mounting
3. Description: Mounted to posts and through fastened through glass panels.
4. Model: RB51
 - a. Post mounting
 - b. Swivel mounting
5. Material:
 - a. 316 alloy Stainless steel
6. Finish: (To be selected by Architect from the following)
 - a. FBS: Brushed stainless steel
 - b. FPS: Polished stainless steel
7. Accessories:
 - a. All tread stainless steel bolts
 - b. Washers
 - c. Gaskets

E. Glazing components:

1. Glass panels:
 - a. As specified.

F. Top Cap Railing – Glazing Panels:

1. System: GRS Cap Railing Systems
2. Assembly: Bum-forming formed rails
3. Description: Slide over top edge of glazing panels with end caps and splices
4. Profile: Round
5. Size: 1 1/2 -inch diameter for glass thickness
6. Material: Aluminum
7. Accessories:
 - a. Factory formed corners with Connector sleeves
 - b. Contact cement.
 - c. CRL Cap Rail Rubber Inserts by size and model for rail size
 - d. End caps
 - e. Stabilizing End Caps to secure to wall with fasteners

G. Handrails:

1. System: HRS Hand Railing Systems
2. Assembly: Full lengths between bends
3. Description: Handrail
4. Material: Schedule 40 pipe rail tubing
5. Model: ARHR15CRM

- 6. Profile: Round
- 7. Size: 1 1/2 -inch O.D. diameter
- 8. Material: Aluminum

2.2 GLASS PRODUCTS, GLAZING PANELS

- A. Material:
 - 1. Tempered:
 - a. ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3 (glazing select) with polished edges and dubbed (blunt) corners. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials as listed below:
 - 2. Color: Clear Glass, Class 1 (clear).
 - 3. Thickness: 1/2 -inch
 - 4. Assembly:
 - a. Eased edges
 - b. Predrilled with holes for attachment fittings

2.3 METALS

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.4 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes: ASTM B 221 (ASTM B 221M), Alloy 6063-T5/T52.
- C. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- D. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.5 STAINLESS STEEL MATERIALS

- A. Tubing: ASTM A 554, Grade MT 316.
- B. Pipe: ASTM A 312/A 312M, Grade TP 316.
- C. Plate and Sheet: ASTM A 666, Type 316.
- D. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

DECORATIVE METAL AND GLASS RAILINGS

2.6 FASTENERS

- A. General: Provide the following:
 - 1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
- D. Anchors shall be fabricated from stainless steel or other materials as determined by engineering requirements with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E488.

2.7 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Stainless steel tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32-inch**, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form work true to line and level with accurate angles and surfaces.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.
- H. Post shall be factory custom fabricated to required length.

2.9 GLAZING PANEL FABRICATION

- A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
 - 1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces
 - 2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.

2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- D. All materials shall be factory finished.

2.11 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2.12 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform finish indicated, free of cross scratches.
 - 1. Run grain of directionally textured finishes with long dimension of each piece.
- C. Finish as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Installation must be in accordance with standard or non-standard, yet applicable details (instructions) included on installation/shop drawings.
- B. Install components plumb and in-line, accurately fitted, free from distortion or defects and securely anchored to structure.
- C. Provide anchors, plates, angles, etc., necessary for connecting railings to structure.
- D. Any and all field welding shall be by a certified welder.
- E. Access for anchors that require through bolting either vertically or horizontally to be made available through General Contractor.
- F. Fit exposed connections together to form tight, hairline joints.
- G. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed **1/4 -inch** in **12 -feet**.
- H. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- I. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 ERECTION TOLERANCES

- A. Maximum variation from plumb shall be **1/4 -inch**.
- B. Maximum offset from true alignment for every **50 -foot** of railing shall be **1/4 -inch**, non-accumulative.

3.4 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

3.5 ATTACHING HANDRAILS TO GLASS / GLAZING

- A. Attach handrails to glazing with concealed surface mounted hand railing bracket. Provide brackets with **1-1/2 -inch** minimum clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.6 ADJUSTING AND CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.7 PROTECTION

- A. Provide protective covering on all hand and guardrails if construction is not yet finished in the area.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

- END OF SECTION -

DIVISION 06 – WOODS, PLASTICS AND COMPOSITES

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- SECTION 06 0573 -**WOOD TREATMENT**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Preservative and Fire Retardant treatments for exterior and interior wood.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 06 1053 "Miscellaneous Rough Carpentry".
- D. Section 06 2000.01 "Finish Carpentry (Courtyard)"
- E. Section 06 2000.02 "Finish Carpentry (Residence Inn)"
- F. Section 06 4200 "Wood Paneling"
- G. Section 06 4023 "Interior Architectural Woodwork".
- H. Section 09 9113 "Exterior Painting".
- I. Section 09 9123 "Interior Painting".
- J. Section 09 9123.13 "Interior Paint Schedule".
- K. Section 09 9300 "Staining and Transparent Finishing".
- L. Section 09 9646 "Intumescent Finishing".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Dimension Lumber: Lumber of 2-inches nominal (38 mm actual) or greater but less than 5 - inches nominal (114 mm actual) in least dimension.
- B. Interior Finish Woodwork: Includes all wall and ceiling paneling, wainscoting, wall paneling, partitions, built-up column, pilaster and beam details and other similar exposed finish elements. Not included are flooring, stair treads and risers, picture molds, chair rails, baseboards, handrails, doors and window frames, and similar decorative or protective materials used in fixed applications.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Indicate component materials and dimensions and include construction and application details.
 - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used and compliance with applicable standards.
 - 2. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 3. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 4. For fire-retardant treatments specified to be High-Temperature (HT) type include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 5. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 6. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
 - 7. Include chemical treatment manufacturer's MSDS and instructions for handling, storing, installing, and finishing treated materials
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. As specified in related sections.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MANUFACTURERS

- A. Wood-Preservative-Treated Materials:
 - 1. Baxter: J. H. Baxter Co.
 - 2. Chemical Specialties, Inc.
 - 3. Continental Wood Preservers, Inc.
 - 4. Hickson Corp.
 - 5. Hoover Treated Wood Products, Inc.
 - 6. Osmose Wood Preserving, Inc.
 - 7. Other as approved by the Architect.
- B. Fire-Retardant Treatment Products and Manufacturers:
 - 1. "Burn Barrier" series products, as mfr by Fire Retardants, Inc.
 - 2. Various products, Arch Treatment Technologies, Inc., Atlantis, GA.
 - 3. Various products, Wood Preservers, Inc., Warsaw, VA.
 - 4. Osmose Wood Preserving, Inc.
 - 5. Other as approved by Architect.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS (PT)

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood blocking and similar concealed members in contact with masonry or concrete.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPAC20 (lumber) and AWPAC27 (plywood).
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Use Exterior type for exterior locations and where indicated.
 - 3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Plywood backing panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Treat materials after initial fabrication and cutting is complete, to extent possible. Field treat all cut edges, pre-drilled holes, dados, etc. as required before material is covered up or final finished.
- B. Comply with AWPAM4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

3.3 SCHEDULE

- A. Treat the following interior finish materials, as needed, to meet the Material Class requirements of referenced code. Minimum levels of treatment required:
1. Class B at the following locations: (minimum)
 - a. All Interior Finish Woodwork at lower level corridors and lobby areas.
 - b. All Interior Finish Woodwork at main level public area corridors and lobby areas.
 - c. All Interior Finish Woodwork in all stairways, exit enclosures, and exit passageways.
 2. Class C at the following locations: (minimum)
 - a. All Corridors serving Guest Rooms.
 - b. All other Rooms and Spaces not otherwise listed in this schedule.
- B. Additional treatment requirements as specified in other sections of these specifications.

- END OF SECTION -

- SECTION 06 1053 -**MISCELLANEOUS ROUGH CARPENTRY**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood blocking and nailers.
 - 2. Plywood backing panels, for telephone and communications equipment.
 - 3. Wood sleepers.
 - 4. Hardboard backing panels behind ladders and other high-traffic areas.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 05 5000 "Metal Fabrications"
- E. Section 06 2000.01 "Finish Carpentry (Courtyard)" for nonstructural carpentry items exposed to view and not specified in another section.
- F. Section 06 2000.02 "Finish Carpentry (Residence Inn)" for nonstructural carpentry items exposed to view and not specified in another section.
- G. Section 06 4023 Interior Architectural Woodwork

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 -inches nominal (38 mm actual) or greater but less than 5 -inches nominal (114 mm actual) in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments specified to be High-Temperature (HT) type include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.7 INFORMATIONAL SUBMITTALS

- A. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Power-driven fasteners.
 - 4. Powder-actuated fasteners.
 - 5. Expansion anchors.
 - 6. Metal framing anchors.
- B. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700 "Closeout Procedures".
 - 2. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- C. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: **15 percent** unless otherwise indicated.
- C. All products shall meet current CARB Airborne Toxic Control Measure (ATCM) for Composite Wood Formaldehyde Limits by Mandatory Compliance Dates as specified in Section 01 6116.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS (PT)

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood blocking, sleepers and similar concealed members in contact with masonry or concrete.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPAC20 (lumber) and AWPAC27 (plywood).
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Refer to Section 06 0573 "Wood Treatment"
 - 3. Use Exterior type for exterior locations and where indicated.
 - 4. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 - 5. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Plywood backing panels.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Spruce-pine-fir; NLGA.
 - 3. Hem-fir; WCLIB, or WWPA.
 - 4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 5. Western woods; WCLIB or WWPA.
- C. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 BACKING PANELS

- A. Telephone, Low Voltage and Electrical Equipment Backing Panels: Plywood DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 -inch (13-mm) nominal thickness.
- B. Wall Protection Backing Panels: Hardboard: ANSI A135.4, tempered.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.8 METAL FRAMING ANCHORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cleveland Steel Specialty Co.
 - 2. Harlen Metal Products, Inc.
 - 3. KC Metals Products, Inc.

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4. Simpson Strong-Tie Co., Inc.
 5. Southeastern Metals Manufacturing Co., Inc.
 6. USP Structural Connectors.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, **G60 (Z180)** coating designation.
1. Use for interior locations where stainless steel is not indicated.

2.9 DIMENSION LUMBER FRAMING

- A. Ceiling Joists: Select Structural grade.
1. Species:
 - a. Hem-fir (north); NLGA. (Originally item a)
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWPA.
 - d. Douglas fir-larch (north); NLGA.
 - e. Mixed southern pine; SPIB.
 - f. Spruce-pine-fir; NLGA.
 - g. Hem-fir; WCLIB or WWPA.
 - h. Douglas fir-south; WWPA.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports, unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than **16 -inches (406 mm)** o.c.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 -inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2 -inch nominal (38-mm actual-) thickness.
- G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- J. Use common wire nails, unless otherwise indicated.
 1. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials.
 2. Make tight connections between members.
 3. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work.
 1. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading.
 1. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings.
 1. Shim with wood as required for tolerance of finish work.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather.
 - 1. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment.
 - 2. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather.
 - 1. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment.
 - 2. Apply borate solution by spraying to comply with EPA-registered label.

- END OF SECTION -

- SECTION 06 1600 -

SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wall sheathing and installation.
 - 2. Soffit sheathing and installation.
 - 3. Sheathing joint-and-penetration treatment.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent sections specifying wall cladding applied over sheathing.
- C. Section 05 1200 "Structural Steel Framing".
- D. Section 04 2115 "Adhered (Thin) Brick Masonry".
- E. Section 05 1200 "Structural Steel Framing".
- F. Section 05 4000 "Cold Formed Metal Framing" for exterior framed walls.
- G. Section 06 1053 "Miscellaneous Carpentry".
- H. Section 07 2100 "Thermal Insulation"
- I. Section 07 2419 "Exterior Insulation and Finish System"
- J. Section 07 2500 "Fluid-Applied Membrane Air Barriers".
- K. Section 07 9213 "Exterior Façade Joint Sealants"
- L. Section 09 2900 "Gypsum Board" for gypsum sheathing installed at interior conditions and including as substrate for Section 09 9628 "High Performance Acrylic Finish system."

- M. Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools" for finish system.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM International (ASTM):
1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
 2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
 6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
 8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials "California
- C. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.6 INFORMATIONAL SUBMITTALS

- A. Research/Evaluation Reports: For the following, from ICC-ES, showing compliance with building code in effect for Project:
1. Fiberglass-Mat Faced Gypsum Sheathing

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to specified Building Code for fire rated assemblies as indicated on drawings.
- B. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install mockups for the following:
 - a. Joint treatment.

SHEATHING

- 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Single-Source Responsibility for Panel Products: Obtain gypsum sheathing and other panel products from a single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Stack panels flat with spacers between each bundle to provide air circulation.
 - 1. Protect sheathing from weather by covering with waterproof sheeting, securely anchored.
 - 2. Provide for air circulation around stacks and under coverings.
 - 3. Support panels to prevent sagging.
- C. Handle gypsum sheathing to prevent damage to edges, ends, and surfaces.

1.9 WARRANTY

- A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).
- B. Manufacturer's Warranty:
 - 1. Five (5) years against manufacturing defects.
 - 2. Ten (10) years against manufacturing defects when used as a substrate in Architecturally specified EIFS.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives, sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory." and GA-600, "Fire Resistance Design Manual."
- C. Gypsum Sheathing:
 - 1. Mold-resistant board is required at all locations.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273.
 - 3. Microbial Resistance: Will not support microbial growth, ASTM D6329, GREENGUARD 3-week protocol.
 - 4. Permeance: Not more than 17 perms, ASTM E96

5. Humdified Deflection: Not more than 1/8 -inch, ASTM C1177
6. R-Value: 0.67, ASTM C518
7. Flexural Strength: (4 -foot weak direction) 100 lbf, parallel, ASTM C1177
8. Compressive strength: Minimum 500 psi (3445 kPa)
9. Racking strength: (Ultimate, not design strength) Not less than 654 lbs/square -foot, ASTM E72
10. Surface burning characteristics: 0 Smoke Developed and 0 Flame spread

2.2 PANELS, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than manufacturer's standard percent.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 WALL SHEATHING

- A. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C 1177 or ASTM C 1177 M, gypsum sheathing; with water-resistant-treated core and with fiberglass mat GOLD colored primer coating bonded to core's face, back, and long edges.
 1. Product: Subject to compliance with requirements, provide Type-X "DensGlass® Fireguard" by G-P, Georgia-Pacific Gypsum Corporation LLC, www.gp.com or an equivalent by one of the following:
 - a. American Gypsum, M-Glass Exterior Sheathing, www.americangypsum.com
 - b. LaFarge North America Inc, Weather Defense® Platinum sheathing, www.lafarge-na.com
 - c. National Gypsum Company, Gold Bond® eXP®, www.nationalgypsum.com
 - d. Temple-Inland Forest Products Corporation, GreenGlass Exterior Sheathing, www.temple.com
 - e. United States Gypsum Co., Securerock®
 - f. Substitutions: Section 01 2500. Glass-Mat Sheathing, www.usg.com
 2. Core: 5/8 -inch (15.9 mm), Type X, ASTM C1177
 3. Size:
 - a. Width: 48 -inches
 - b. Length: 96 -inches, 108 -inches and 120 -inches for vertical installation.

2.4 SHEATHING FOR CEILINGS AND SOFFITS

- A. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C 1177 or ASTM C 1177 M, gypsum sheathing; with water-resistant-treated core and with fiberglass mat GOLD colored primer coating bonded to core's face, back, and long edges.
 1. Product: Subject to compliance with requirements, provide Type-X "DensGlass® Fireguard" by G-P, Georgia-Pacific Gypsum Corporation LLC, www.gp.com or an equivalent by one of the following:
 - a. American Gypsum, M-Glass Exterior Sheathing, www.americangypsum.com
 - b. National Gypsum Company, Gold Bond® eXP®, www.nationalgypsum.com

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- c. Substitutions: Section 01 2500. Glass-Mat Sheathing, www.usg.com
- 2. Core: 5/8 -inch (15.9 mm), Type X, ASTM C1177
- 3. Size:
 - a. Width: 48 -inches
 - b. Length: 96 -inches, 108 -inches and 120 -inches for vertical installation.

- B. Source Limitations: Provide ceiling board by same manufacturer as wall sheathing.

2.5 FASTENERS

- A. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Corrosion resistant treated steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than 0.0329 -inch (0.835 mm) thick, attach sheathing to comply with ASTM C 1002.
 - 2. For steel framing from 0.033 -inches to 0.112 inches (0.84 to 2.84 mm) thick, attach sheathing to comply with ASTM C 954.
- B. Power-Driven Fasteners: NES NER-272.

2.6 WEATHER BARRIER AND WEATHER-RESISTANT MEMBRANE

- A. Type specified in Section 07 2500.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Refer to Section 07 9213 "Exterior Façade Joint Sealants" for penetration sealant.
- B. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- C. Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
- D. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, minimum 2 -inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.8 MISCELLANEOUS MATERIALS

- A. Membrane type specified in Section 07 2500.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.
- B. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - 1. Arrange joints so that pieces do not span between fewer than three support members.
- C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- D. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Requirements of referenced Building Code.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a **3/8-inch (9.5-mm)** gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a **1/4-inch (6.4-mm)** gap where they abut masonry, concrete or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - 1. Space fasteners approximately **8 -inches (200 mm)** o.c. and set back a minimum of **3/8 -inch (9.5 mm)** from edges and ends of boards.
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
1. Space fasteners approximately 8 -inches (200 mm) o.c. and set back a minimum of 3/8 -inch (9.5 mm) from edges and ends of boards.
 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.3 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions. Treat all gaps greater than 1/4 -inch with sealants.
1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.4 WEATHER RESISTIVE BARRIER AND FLEXIBLE FLASHING INSTALLATION

- A. As specified in Section 07 2500.

- END OF SECTION -

- SECTION 06 2000.01 -

FINISH CARPENTRY (COURTYARD)

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: **(COURTYARD & PUBLIC SPACES)**
 - 1. Wood Millwork
 - a. Interior Standing and Running Trim
 - 2. Shelving
 - 3. Specialty Finish – 3D Laminate

1.3 RELATED REQUIREMENTS

- A. Section 06 1053 "Miscellaneous Rough Carpentry"
- B. Section 06 2000.02 "Finish Carpentry (Residence Inn)"
- C. Section 06 4023 "Interior Architectural Woodwork"
- D. Section 09 2116.23 "Gypsum Board Shaft Wall Assemblies"
- E. Section 09 2900 "Gypsum Board"
- F. Section 09 9123 "Interior Painting"
- G. Section 09 9123.13 "Paint Schedule"
- H. Section 09 9300 "Staining and Transparent Finishing"
- I. Section 12 3000 "Architectural Woodwork"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [American Wood Council / American Forest & Paper Association \(AF&PA\)](#) Publications:
 - 1. ANSI/AF&PA NDS-2005: "National Design Specification (NDS) for Wood Construction".
- C. [AWI](#) Quality Standards
- D. [American Wood-Preservers's Association \(AWPA\)](#) Publications:
 - 1. C20 "Structural Lumber - Fire-Retardant Treatment by Pressure Processes"
- E. [ASTM International](#) Publications:
 - 1. E84-03: Test Method for Surface-Burning Characteristics of Building Materials
 - 2. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware "
 - 3. C1185 "Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards."
 - 4. C1186 "Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets."
- F. U.S. Department of Commerce, [National Institute of Standards and Technology \(NIST\)](#)
 - 1. DOC PS 1 "Construction and Industrial Plywood"
 - 2. DOC PS 20 "American Softwood Lumber Standard"
- G. [Hardwood Plywood & Veneer Association \(HPVA\)](#)
 - 1. ANSI/HPVA HP-1: "American National Standard for Hardwood and Decorative Plywood"

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Submit Letter of Conformance -inch in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
- C. Product Data and Shop Drawings: For each type of product specified.
 - 1. Product Data indicating component profiles and fastening and joining details.
 - 2. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 - 3. Samples for verification of the following:
 - a. Lumber products with factory-applied finish, 50 sq. -inch for lumber for each finish system and color.
 - b. Linear Moldings: 2-foot-long section with finished joint. Show complete pattern.
 - c. Nonlinear Shapes: Full-size unit.
 - 4. Shop Drawings: Show profiles, thicknesses, finishes, joints, ornamentation, installation tolerances, and anchorage details. Indicate attachment methods, embedded supports, reinforcement, fabrication methods, joint treatments, clearances, and supports.

- a. Show connection to suspension system and cutouts for sprinklers, diffusers, grilles, speakers, and lighting fixtures.

1.6 QUALITY ASSURANCE

- A. Factory-mark each piece of lumber and plywood with type, grade, mill, and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.
- B. Perform finish carpentry work in accordance with [AWI](#) Quality Standards, Custom Grade.
- C. Fire-Test-Response Characteristics: Provide glass-reinforced gypsum fabrications with the following surface-burning characteristics as determined by testing identical products per [ASTM](#) E84 by UL or another independent testing and inspecting agency acceptable to authorities having jurisdiction:
 1. Flame Spread: 25 or less.
 2. Smoke Developed: 450 or less.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finish carpentry materials during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.
- B. Do not deliver finish carpentry materials, until painting, wet work, grinding, and similar operations which could damage, soil, or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.
- C. Ship and store glass-reinforced gypsum fabrications in factory-wrapped crates, packaged to keep units dry. Avoid cracking, warping, or staining the units.

1.8 PROJECT CONDITIONS

- A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas.
- B. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels throughout the remainder of construction period.
 1. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity.
 2. Acclimatize glass-reinforced gypsum fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.

- C. Weather Limitations: Proceed with installing exterior finish carpentry only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.
- D. Field Measurements: Where glass-reinforced gypsum fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 COORDINATION

- A. Coordinate layout and installation of glass-reinforced gypsum fabrications and suspension system components with other construction, including ceilings, light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber Standards: Comply with [DOC PS 20](#), American Softwood Lumber Standard, and with applicable grading rules of inspection agencies certified by [ALSC's](#) Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. [Northeastern Lumber Manufacturers Association \(NeLMA\)](#)
 - 2. [National Lumber Grades Authority](#) (Canadian) ([NLGA](#))
 - 3. [Redwood Inspection Service](#) (RIS)
 - 4. [SPIB - Southern Pine Inspection Bureau](#)
 - 5. [West Coast Lumber Inspection Bureau \(WCLIB\)](#)
 - 6. [Western Wood Products Association \(WWPA\)](#)
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.
- D. Softwood Plywood: Comply with [DOC PS 1](#), U.S. Product Standard for Construction and Industrial Plywood.
- E. Hardwood Plywood: Comply with ANSI/[HPVA](#) HP-1, Interim Voluntary Standard for Hardwood and Decorative Plywood.

2.2 INTERIOR VENEERS & PANELS AND STANDING & RUNNING TRIM

- A. Hardwood Lumber: PS 58; Premium Grade in accordance with [AWI](#); maximum moisture content of 15 percent.
1. Stained Interior Wood Veneers and Panels (Typical):
 - a. COURTYARD & PUBLIC SPACES:
 - 1) Rift Cut White Oak
 - a) Stained to match; Wilsonart Laminate, Loft Oak #7968K-12.
 - b) Sizes and shapes shown on Drawings, of straight grain type sufficient to receive stained finish, smooth surfaced.
 2. Stained Interior Standing and Running Trim (Typical):
 - a. COURTYARD & PUBLIC SPACES:
 - 1) Rift Cut Alder, Beech
 - a) Stained to match; Wilsonart Laminate, Loft Oak #7968K-12.
 - b) Sizes and shapes shown on Drawings, of straight grain type sufficient to receive stained finish, smooth surfaced.
 3. Painted Interior Wood Trim and Millwork:
 - a. Poplar, Paint Grade, solid lumber stock.
 - 1) Locations only as indicated on Drawings.
 - 2) Sizes and shapes shown on Drawings, of grain type sufficient to receive stained finish, smooth surfaced.
 4. Painted Interior Standing and Running Trim:
 - a. Poplar, Paint Grade, solid lumber stock.
 - 1) Locations only as indicated on Drawings.
 - 2) Sizes and shapes shown on Drawings, of grain type sufficient to receive stained finish, smooth surfaced.
- B. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and patterns as shown, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners and Anchorages: Provide nails, screws, and other anchoring devices of the type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications. Provide in sufficient length to penetrate minimum of **1-1/2 -inches** into substrate, unless otherwise recommended by manufacturer.
1. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating complying with [ASTM](#) A153, or stainless steel.

2.4 FABRICATION – WOOD FINISH CARPENTRY

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry on relative humidity conditions existing during time of fabrication and in installation areas.

- B. Fabricate finish carpentry to dimensions, profiles, and details indicated.
 - 1. Back out or kerf backs of the following members, except members with ends exposed in finished work:
 - a. Interior standing and running trim, except shoe mold and crown mold.
 - 2. Ease edges of lumber less than 1 -inch (25 mm) in nominal thickness to 1-1/6 -inch (1.5 mm) radius.

2.5 SHEET MATERIALS

- A. Shelving: 3/4 -inch thick by width shown on Drawings, Hardwood Plywood; custom grade in accordance with [AWI](#); core material of veneer; type of bond recommended for application; with minimum 3/4 -inch x 1-1/4 -inch hardwood nosing.
- B. Softwood Plywood: DOC PS 1, Medium Density Overlay.

2.6 SPECIALTY – 3D LAMINATE, MATERIALS (SF-1)

- A. Material: Class 1 flame retardant medium density fiberboard (MDF) panel with decorative surface profile.
- B. Manufacturer: Panelmax, www.panelmax.biz
- C. Material Mfgr: SierraPine Composite Soultions, Medite FR
- D. Type: 4 –feet by 8 – foot panels
- E. Pattern:
 - 1. Refer to Drawings.

2.7 FIRE RETARDANT TREATED (FRT) LUMBER

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. Lumber:
 - a. Dricon FRT”; [Archwood Protection Inc.](#) (770-801-6600)
 - b. “Pyro-Guard”; [Hoover Treated Wood Products, Inc.](#) (877-722-6292, ext. 211)
 - c. “FirePRO FR Lumber”; [Osmose Wood Preserving, Inc.](#) (404-228-8434)
 - 2. Plywood:
 - a. “Exterior Fire-X”; [Hoover Treated Wood Products, Inc.](#) (877-722-6292, ext. 211)
- C. Comply with performance requirements in [AWPA](#) C20, Exterior type. Kiln dry after treatment to a maximum moisture content of 19 percent.
- D. Flamespread and smoke developed ratings of 25 or less by [ASTM](#) E84, with no sign of progressive combustion when test is extended to 30 minutes.

- E. Toxicity/IEQ: Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerance and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.
- C. Prime and backprime lumber for painted finish exposed on the exterior not indicated as factory prefinished. Comply with requirements for surface preparation and application in Division 09 Section Painting.
- D. Ensure that all electrical or other services are in place.

3.3 INSTALLATION – FINISH CARPENTRY

- A. Discard units of material which are unsound, warped, bowed, twisted improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install the work plumb, level, true, and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 -inch in 8 -feet -0 -inch for plumb and level countertops; and with 1/16 -inch maximum offset in flush adjoining 1/8 -inch maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
- E. Install to tolerance of 1/8 -inch in 96 -inches for plumb and level. Install adjoining finish carpentry with 1/32 -inch maximum offset for flush installation and 1/16 -inch maximum offset for reveal installation.
- F. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
- G. Finish according to specified requirements.

- H. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 -inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.
 - 1. Match color and grain pattern across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent spitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
 - 4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.5 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

- A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up factory-applied finishes to restore damaged or soiled areas.
- C. Preparation for Finishing: Sand work smooth and set all nails and screws. Apply wood filler in exposed nail and screw indentations.
- D. Cleaning: Keep premises in a neat, safe, and orderly condition at all times during execution of this portion of the work, free from the accumulation of sawdust, cut-ends, and debris.
- E. Refer to Division 09 sections for final finishing of installed finish carpentry work.
- F. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

- END OF SECTION -

- SECTION 06 2000.02 -

FINISH CARPENTRY (RESIDENCE INN)

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: **(RESIDENCE INN)**
 - 1. Wood Millwork
 - a. Interior Standing and Running Trim
 - 2. Wood Shelving.
 - 3. Specialty Finish – 3D Laminate

1.3 RELATED REQUIREMENTS

- A. Section 06 1053 "Miscellaneous Rough Carpentry"
- B. Section 06 2000.01 "Finish Carpentry (Courtyard)"
- C. Section 06 4023 "Interior Architectural Woodwork"
- D. Section 09 2116.23 "Gypsum Board Shaft Wall Assemblies"
- E. Section 09 2900 "Gypsum Board"
- F. Section 09 9123 "Interior Painting"
- G. Section 09 9123.13 "Paint Schedule"
- H. Section 09 9300 "Staining and Transparent Finishing"
- I. Section 12 3000 "Architectural Woodwork"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

- B. [American Wood Council / American Forest & Paper Association \(AF&PA\)](#) Publications:
 - 1. ANSI/AF&PA NDS-2005: "National Design Specification (NDS) for Wood Construction".
- C. [Architectural Woodwork Institute \(AWI\)](#) Publications:
 - 1. "Architectural Woodwork Quality Standards"
- D. [American Wood-Preservers's Association \(AWPA\)](#) Publications:
 - 1. C20 "Structural Lumber - Fire-Retardant Treatment by Pressure Processes"
- E. [ASTM International](#) Publications:
 - 1. E84-03: Test Method for Surface-Burning Characteristics of Building Materials
 - 2. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
 - 3. C1185 "Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards."
 - 4. C1186 "Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets."
- F. U.S. Department of Commerce, [National Institute of Standards and Technology \(NIST\)](#)
 - 1. DOC PS 1 "Construction and Industrial Plywood"
 - 2. DOC PS 20 "American Softwood Lumber Standard"
- G. [Hardwood Plywood & Veneer Association \(HPVA\)](#)
 - 1. ANSI/HPVA HP-1: "American National Standard for Hardwood and Decorative Plywood"

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
- C. Product Data and Shop Drawings: For each type of product specified.
 - 1. Submit Product Data and Shop Drawings indicating component profiles and fastening and joining details.
 - 2. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 - 3. Samples for verification of the following:
 - a. Lumber products with factory-applied finish, 50 sq. inches for lumber for each finish system and color.

1.6 QUALITY ASSURANCE

- A. Factory-mark each piece of lumber and plywood with type, grade, mill, and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.
- B. Perform finish carpentry work in accordance with [AWI](#) Quality Standards, Custom Grade.

FINISH CARPENTRY (RESIDENCE INN)

- C. Fire-Test-Response Characteristics: Provide glass-reinforced gypsum fabrications with the following surface-burning characteristics as determined by testing identical products per [ASTM E84](#) by UL or another independent testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame Spread: 25 or less.
 2. Smoke Developed: 450 or less.
- D. Lumber Siding Installer Qualifications: Engage an experienced Installer who has completed siding similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finish carpentry materials during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.
- B. Do not deliver finish carpentry materials, until painting, wet work, grinding, and similar operations which could damage, soil, or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.8 PROJECT CONDITIONS

- A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas.
- B. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels throughout the remainder of construction period.
1. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity.
- C. Weather Limitations: Proceed with installing exterior finish carpentry only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber Standards: Comply with [DOC](#) PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by [ALSC](#)'s Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. [Northeastern Lumber Manufacturers Association](#) ([NeLMA](#))
 - 2. [National Lumber Grades Authority](#) (Canadian) ([NLGA](#))
 - 3. [Redwood Inspection Service](#) (RIS)
 - 4. [SPIB - Southern Pine Inspection Bureau](#)
 - 5. [West Coast Lumber Inspection Bureau](#) ([WCLIB](#))
 - 6. [Western Wood Products Association](#) ([WWPA](#))
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.
- D. Softwood Plywood: Comply with [DOC](#) PS 1, "U.S. Product Standard for Construction and Industrial Plywood."
- E. Hardwood Plywood: Comply with ANSI/[HPVA](#) HP-1, "Interim Voluntary Standard for Hardwood and Decorative Plywood."

2.2 INTERIOR VENEERS & PANELS AND STANDING & RUNNING TRIM,

- A. Hardwood Lumber: PS 58; Premium Grade in accordance with [AWI](#); maximum moisture content of 15 percent.
 - 1. Stained Interior Wood Veneers and Panels (Typical):
 - a. RESIDENCE INN:
 - 1) Rift Cut White Oak
 - a) Stained to match; Wilsonart Laminate, Warehouse Oak #7969K-12.
 - b) Sizes and shapes shown on Drawings, of straight grain type sufficient to receive stained finish, smooth surfaced.
 - 2. Stained Interior Standing and Running Trim (Typical):
 - a. RESIDENCE INN:
 - 1) Rift Cut Alder, Beech
 - a) Stained to match; Wilsonart Laminate, Warehouse Oak #7969K-12.
 - b) Sizes and shapes shown on Drawings, of straight grain type sufficient to receive stained finish, smooth surfaced.
 - 3. Painted Interior Wood Trim and Millwork:
 - a. Poplar, Paint Grade, solid lumber stock.

- 1) Locations only as indicated on Drawings.
- 2) Sizes and shapes shown on Drawings, of grain type sufficient to receive stained finish, smooth surfaced.
4. Painted Interior Standing and Running Trim:
 - a. Poplar, Paint Grade, solid lumber stock.
 - 1) Locations only as indicated on Drawings.
 - 2) Sizes and shapes shown on Drawings, of grain type sufficient to receive stained finish, smooth surfaced.
- B. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and patterns as shown, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners and Anchorages: Provide nails, screws, and other anchoring devices of the type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications. Provide in sufficient length to penetrate minimum of **1-1/2 inches** into substrate, unless otherwise recommended by manufacturer.
 1. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating complying with [ASTM A153](#), or stainless steel.

2.4 SHEET MATERIALS

- A. Shelving: **3/4 -inch** thick by width shown on Drawings, Hardwood Plywood; custom grade in accordance with [AWI](#); core material of veneer; type of bond recommended for application; with minimum **3/4 -inch** by **1-1/4 -inch** hardwood nosing.
- B. Interior Wood Column Surround: **3/4 -inch** thick by width shown on Drawings, Hardwood Veneered Plywood: PS 51; custom grade in accordance with [AWI](#); core material of veneer; type of bond recommended for application.
 1. Veneer Species: Poplar, Grade 1
 2. Grain: Plain Sliced.

2.5 SPECIALTY – 3D LAMINATE, MATERIALS (SF-1)

- A. Material: Class 1 flame retardant medium density fiberboard (MDF) panel with decorative surface profile.
- B. Manufacturer: Panelmax, www.panelmax.biz
- C. Material Mfg: SierraPine Composite Solutions, Medite FR
- D. Type: **4 -feet** by **8 - foot** panels
- E. Pattern:
 1. Refer to Drawings.

2.6 FIRE RETARDANT TREATED (FRT) LUMBER

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. Lumber:
 - a. "Dricon FRT"; [Lonza Wood Protection](#) (678-627-2000)
 - b. "Pyro-Guard"; [Hoover Treated Wood Products, Inc.](#) (877-722-6292, ext. 211)
 - c. "FirePRO FR Lumber"; [Osmose Wood Preserving, Inc.](#) (404-228-8434)
 - 2. Plywood:
 - a. "FRX Exterior FRT"; [Lonza Wood Protection](#) (678-627-2000)
 - b. "Exterior Fire-X"; [Hoover Treated Wood Products, Inc.](#) (877-722-6292, ext. 211)
- C. Comply with performance requirements in [AWPA](#) C20, Exterior type. Kiln dry after treatment to a maximum moisture content of 19 percent.
- D. Flamespread and smoke developed ratings of 25 or less by ASTM E84, with no sign of progressive combustion when test is extended to 30 minutes.
- E. Toxicity/IEQ: Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.

2.7 FABRICATION – WOOD FINISH CARPENTRY

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry on relative humidity conditions existing during time of fabrication and in installation areas.
- B. Fabricate finish carpentry to dimensions, profiles, and details indicated.
 - 1. Back out or kerf backs of the following members, except members with ends exposed in finished work:
 - a. Interior standing and running trim, except shoe mold and crown mold.
 - 2. Ease edges of lumber less than 1 -inch (25 mm) in nominal thickness to 1-1/6 -inch (1.5 mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerance and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

FINISH CARPENTRY (RESIDENCE INN)

- B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.
- C. Prime and backprime lumber for painted finish exposed on the exterior not indicated as factory prefinished. Comply with requirements for surface preparation and application in Division 09 Section "Painting."
- D. Ensure that all electrical or other services are in place.

3.3 INSTALLATION – FINISH CARPENTRY

- A. Discard units of material which are unsound, warped, bowed, twisted improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install the work plumb, level, true, and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 -inch in 8 -feet-0 -inch for plumb and level countertops; and with 1/16 -inch maximum offset in flush adjoining 1/8 -inch maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
- E. Install to tolerance of 1/8 -inch in 96 -inches (3 mm in 2400 mm) for plumb and level. Install adjoining finish carpentry with 1/32 -inch (0.8 mm) maximum offset for flush installation and 1/16 -inch (1.5 mm) maximum offset for reveal installation.
- F. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
- G. Finish according to specified requirements.
- H. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.4 WOOD STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 -inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.
 - 1. Match color and grain pattern across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.

3. Drill pilot holes in hardwood before fastening to prevent spitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.5 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

- A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up factory-applied finishes to restore damaged or soiled areas.
- C. Preparation for Finishing: Sand work smooth and set all nails and screws. Apply wood filler in exposed nail and screw indentations.
- D. Cleaning: Keep premises in a neat, safe, and orderly condition at all times during execution of this portion of the work, free from the accumulation of sawdust, cut-ends, and debris.
- E. Refer to Division 09 sections for final finishing of installed finish carpentry work.
- F. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

- END OF SECTION -

- SECTION 06 4023 -**INTERIOR ARCHITECTURAL WOODWORK**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following shop fabricated items:
 - 1. Refer to drawings for complete lists of materials and components.
 - 2. Custom millwork.
 - 3. Closet Wood Panel built-in shelves
 - 4. Interior Frames and Jambs for cased openings.
 - 5. Wood cabinets.
 - 6. Custom mirror frames.
 - 7. Built-In wood benches and seats.
 - 8. Custom Plastic-laminate cabinets.
 - 9. Cabinet hardware.
 - 10. Glass tops, decorative glazing and mirrors.
 - 11. Shop finishing of interior woodwork.
 - 12. Specialty Finish – 3D Laminate
 - 13. Solid stock Wood material for treads and landings at Monumental stair.
 - a. Refer also to Drawings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 05 5150 "Architectural Metal Stairs" for stair to receive wood treads and landings.
- D. Section 06 0573 "Wood Treatment".
- E. Section 06 1053 "Miscellaneous Rough Carpentry" for furring, blocking, shims, hanging strips and other carpentry, not exposed to view, required for installing woodwork specified in this Section.

- F. Section 06 2000.01 "Finish Carpentry (Courtyard)"
- G. Section 06 2000.02 "Finish Carpentry (Residence Inn)"
- H. Section 06 4200 "Wood Paneling" for shop-fabricated interior wood paneling.
- I. Section 06 6113 "Cultured Marble Fabrications".
- J. Section 08 8000 "Interior Glazing" including, but not limited to interior door glazing.
- K. Section 08 1400.01 (08200) "Wood Doors" (Courtyard)
- L. Section 08 1400.02 (08200) "Wood Doors" (Residence Inn)
- M. Section 08 8300 "Mirrors" for framed and unframed sheet (plate) mirrors not specified in this Section.
- N. Section 09 2216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring architectural woodwork.
- O. Section 09 9300 "Staining and Transparent Finishing"
- P. Section 10 5113 "Metal Lockers" for steel bench bases.
- Q. Section 12 3213 "Manufactured Wood-Veneer-Faced Casework".
- R. Section 12 3216 "Manufactured Plastic Laminate Clad Casework".
- S. Section 12 3530 "Kitchen Casework"(Residence Inn)
- T. Section 12 3616 "Metal Countertops"
- U. Section 12 3619 "Wood Countertops"
- V. Section 12 3623 "Plastic Countertops".
- W. Section 12 3640 "Stone Countertops and Facings".
- X. Section 12 3661 "Quartz Surfacing Countertops and Facings".
- Y. Pertinent sections specifying items built into or penetrating work of this section.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Architectural Woodwork Standards (AWS), 1st ed. 2009, published jointly by:
 - 1. Architectural Woodwork Institute, www.awi.net.org.
 - 2. Woodwork Institute, www.woodworkinstitute.com.
 - 3. Architectural Woodwork Manufacturers Association of Canada, www.awmac.com.

- C. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.

1.5 DEFINITIONS

- A. Interior architectural woodwork includes;
1. Wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include high-pressure decorative laminate adhesive for bonding plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware, accessories, finishing materials and processes.
1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- D. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details full size.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.
 4. Apply AWI-certified compliance label to first page of Shop Drawings.
- F. Samples for Initial Selection:
1. Shop-applied transparent finishes.
 2. Plastic laminates.
 3. PVC edge material.
- G. Samples for Verification:

1. Lumber with or for transparent finish, not less than 5 -inches (125 mm) wide by 5 -inches (125 mm) long, for each species and cut, finished on 1 side and 1 edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
3. Plastic laminates, 5 -inches by 5 -inches (125 by 125 mm) for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
4. Thermoset decorative-panels, 5 -inches by 5 inches (125 by 125 mm), for each type, color, pattern, and surface finish, with edge banding on 1 edge.
5. Door sample of each cabinet door style
6. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 -inches (450 mm) high by 18 -inches (450 mm) wide by 6 -inches (150 mm) deep.
 - b. Miter joints for standing trim.
7. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product, signed by product manufacturer.
- B. Woodwork Quality Standard Compliance Certificates: AWI-certified compliance certificates.
- C. Qualification Data: For fabricator.
- D. Closeout Submittals:
 1. Submit under provisions of Section 01 7700 "Closeout Procedures".
 2. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Licensee of AWI's Certified Compliance Program.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers and wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.
- D. Quality Standard: Unless otherwise indicated, comply with WI's "Manual of Millwork" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.11 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to exact compliance with requirements as herein specified and/or indicated in drawings.

2.3 WOODWORK FABRICATORS

- A. Available Fabricators: Subject to compliance with requirements, fabricators offering interior architectural woodwork that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Architectural Woodwork Institute (AWI) certified fabricators/installers.

2.4 MATERIALS

- A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: Natural finish trim material to have moisture content of 8 percent or less, sanded stained and sealed finish. No finger joint material will be allowed. Sound, tight knots of not over 1/8 - inch in diameter are allowed, provided they are not in clusters. Figured grain or discoloration is allowed provided the wood is such to permit a uniform color when finished.
 - 1. Wood Species: Refer to drawings
 - 2. Cut: Plain sliced unless noted otherwise in drawings.
 - 3. Grade: NHLA Grade FAS.
- C. Wood Species and Cut for Opaque Finish: Either of the following, free of defects affecting strength or appearance, and as approved by the Architect.
 - 1. Wood Species: Any closed-grain hardwood.
 - a. Refer to drawings
 - 2. Wood Species: Southern Pine.
- D. Wood for Locker Room Bench Seats, Transparent Finish:
 - 1. Wood Species:
 - a. Teak, Tectona grandis, certified from sustainable source.
 - b. Refer to drawings for other species
 - 2. Cut: Plain sliced unless indicated otherwise in drawings
 - 3. Grade: NHLA Grade FAS One Face (FIF) and Selects.

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- E. Wood Products: Comply with the following:
1. Industrial Grade Medium Density Fiberboard (MDF) manufactured with a formaldehyde-free adhesive system which meets the physical properties of ANSI A208.2-2009, Grade 155 specifications.
 - a. Product: SierraPine Medite II MDF as manufactured by SierraPine Composite Solutions. Roseville, CA; tel: (800) 676-3339, web: www.sierrapine.com, unless otherwise specified.
 2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue, made with binder containing no urea formaldehyde.
 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde. Face and back veneers shall not be less than 1/32 – inch to 1/42 – inch. thick before sanding.
- F. Thermoset Decorative Panels (Melamine): Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Refer to drawings.
 - b. Abet Laminati, Inc.
 - c. Arborite; Division of ITW Canada, Inc.
 - d. Formica Corporation.
 - e. Lamin-Art, Inc.
 - f. Nevamar Company, LLC; Decorative Products Div.
 - g. Panolam Industries International Incorporated.
 - h. Wilsonart International; Div. of Premark International, Inc.
- H. Tempered Float Glass for Cabinet Doors and Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, with exposed edges seamed before tempering, 6 mm thick minimum and thicker as indicated on drawings.
1. Glass Tops: Minimum Thickness 8mm thick with rounded polished edges.
 2. Glass Type, pattern, etc.
 - a. Refer to Section 08 8113 “Interior and Decorative Glazing”
- I. Decorative Glass: Acid-etched glass with decorative pattern etched into glass with hydrofluoric and hydrochloric acids, evenly applied, according to manufacturer's standard process.
1. Glass Type: Clear fully tempered float glass.
 2. Glass Thickness: 6.0 mm.
 3. Silicone Back Coating: Recommended by glass fabricator for shop application.
 4. Glass Type, pattern, etc.
 - a. Refer to Section 08 8113 “Interior and Decorative Glazing”

- J. Mirrors: Types specified in Section 08 8300. Minimum thickness as required by woodwork quality standard specified in this section.
- K. Countertops: Refer to pertinent Division 6 & 12 sections.

2.5 SPECIALTY – 3D LAMINATE, MATERIALS (SF-1)

- A. Material: Class 1 flame retardant medium density fiberboard (MDF) panel with decorative surface profile.
- B. Manufacturer: Panelmax, www.panelmax.biz
- C. Material Mfr: SierraPine Composite Solutions, Medite FR
- D. Type: 4 – feet by 8 – foot panels
- E. Pattern:
 - 1. Refer to Drawings.

2.6 FIRE-RETARDANT-TREATED MATERIALS

- A. If concealed blocking spaces for paneling or wainscots exceed 1 3/4 -inches in depth, provide finish materials that either meet, or are treated to meet, NC IBC Class A requirements.
 - 1. Refer to Section 06 0573 "Wood Treatment".
- B. Fire-Retardant-Treated Materials, General: As specified in Section 06 0573 and as follows; Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 - 1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

2.7 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood lumber, fire retardant treated where required, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

- C. Metal "Z" Clips: Two-part panel clips, with one part of each clip mechanically attached to back of wood wall panel and the other part to wall substrate, or metal stud, designed to allow for panel removal. Secure bottom of panels with Velcro.
- D. Adhesive for Bonding Plastic Laminate: Contact cement, for general use and for postforming. Use unpigmented product with through-color laminate.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.8 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.
 - 1. Unless indicated otherwise in drawings.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members **3/4 -inch (19 mm)** Thick or Less: **1/16 -inch (1.5 mm)**.
 - 2. Edges of Rails and Similar Members More Than **3/4 -inch (19 mm)** Thick: **1/8 -inch (3 mm)**.
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: **1/16 -inch (1.5 mm)**.
- E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- G. Install glass to comply with applicable requirements in Section 08 8000 "Interior Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.9 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

- A. Grade: Premium
 - 1. Unless indicated otherwise in drawings.
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.
- C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.

2.10 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

- A. Grade: Premium
 - 1. Unless indicated otherwise in drawings.
- B. Wood Species: Match species and cut indicated for other types of opaque-finished architectural woodwork located in same area of building

2.11 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Grade: Premium.
 - 1. Unless indicated otherwise in drawings.
- B. WI Construction Style: Style A, Frameless.
- C. WI Construction Type: Type I, multiple self-supporting units rigidly joined together.
- D. WI Door and Drawer Front Style: Flush overlay.
- E. Reveal Dimension: As indicated.
- F. Wood Species and Cut for Exposed Surfaces: As specified above for hardwood trim, transparent finish.
 - 1. Grain Direction: As indicated.
 - 2. Matching of Veneer Leaves: Book match, unless indicated otherwise in drawings.
 - 3. Vertical Matching of Veneer Leaves: End match, unless indicated otherwise in drawings.
 - 4. Veneer Matching within Panel Face: Center-balance match, unless indicated otherwise in drawings.
 - 5. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
- G. Wood Species and Cut for Exposed Surfaces: White Oak, rift cut unless indicated otherwise in drawings
 - 1. Grain Direction: As indicated.
 - 2. Matching of Veneer Leaves: Book match.
 - 3. Vertical Matching of Veneer Leaves: End match.

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4. Veneer Matching within Panel Face: Center-balance match.
5. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

H. Prefinished Hardwood Plywood:

1. Provide precut, shop finished phenolic film overlay (Fin Color Ply) pre-surfaced multi-purpose interior grade plywood manufactured by Koskien, fabricated by Finland Color Plywood Corporation, Venice, CA , tel: (310) 396-9991, web : www.fcpcusa.com.
2. Wood Species and Cut: White Birch, all sapwood, short grain unless indicated otherwise in drawings.
 - a. Crossbanded 1.5 mm Finland birch hardwood veneers, face sanded on both sides, bonded with phenolic resin adhesive, all sides.
 - b. Thickness: 3/4 -inch, 14 ply.
 - c. Grade: BU.
3. Surface Characteristics: The surface is smooth and hard. It withstands reasonable abrasion, moisture, and common chemicals, including dilute acids and alkalis. The surface can be easily cleaned with a soft damp cloth, avoid abrasive cleaners.
4. Bonding: Panels are bonded with phenolic resin adhesive. The formaldehyde emissions from this glue have a classification of E-1, which is the lowest available.
5. Clear transparent color is presurfaced on both sides with clear melamine film or a lacquered finish.
 - a. Colors are presurfaced on both sides with a colored phenolic resin film.

I. Surface Burning Characteristics: Surface burning characteristics determined by ASTM E-84 twenty-five foot tunnel furnace test method. Test results meet Class C (III)

1. Flame Spread: 200 or less.
2. Flame Spread Index: 145.

J. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
2. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
3. Drawer Bottoms: Hardwood plywood.

K. Provide dust panels of 1/4 -inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.12 PLASTIC-LAMINATE CABINETS

- A. Grade: Premium.
 1. Laminate cabinets to be constructed to support 200 pound dead load on counter top.
- B. WI Construction Style: Style A, Frameless.
- C. WI Construction Type: Type I, multiple self-supporting units rigidly joined together.
- D. WI Door and Drawer Front Style: Flush overlay.

- E. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: Same as laminate cladding on horizontal surfaces.
- F. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: Same as laminate cladding on horizontal surfaces.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade CLS. Color selected by Architect.
 - 2. Drawer Sides and Backs: Thermoset decorative panels.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- G. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. Match Architect's sample, unless otherwise noted on drawings.
- I. Provide dust panels of 1/4 -inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.13 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets provided under this Section.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Butt Hinges: 2-3/4 -inch (70-mm), 5-knuckle steel hinges made from 0.095 -inch (2.4-mm-) thick metal, and as follows:
 - 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
- D. Door and Drawer Pulls: The following are specified for pricing purposes only, final selection by Architect. Provide 2 pulls for drawers more than 24 -inches (600 mm) wide.
 - 1. Public Areas, Guest Areas and Staff Administrative Areas: Refer to drawings
 - 2. Back-Of-House (concealed from public view only): Hafele 117.31.6325 -inch (128mm) center or equal by, Builders Brass Works No., Quality, Stanley or approved equal, polished chrome.
- E. Shelf Rests: BHMA A156.9, B04013. Dark finish at Guest Rooms, Public Areas & Staff Administrative Areas. Satin chrome at all other locations.

- F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, similar those manufactured by Accuride International Inc, and Grant Hardware Co., rated for the following loads:
1. Typical drawers, full extension, **150 lb.** Capacity: Accuride 4032.
 2. Heavy drawers, overtravel design, **150 lb.** Capacity: Accuride 4034 Series.
 3. Shallow drawers, full extension, low profile, **150 lb.** Capacity: Accuride 4032.
 4. File drawers, **1-inch** overtravel, **200 lb.** Capacity, three-section slide, 0.63 inch slide space: Accuride 4337.
- G. Cabinet drawer/door locks: Best/Stanley 5E6, pin tumbler operation, re-keyable and capable of being master keyed. Wafer tumbler locks will not be acceptable.
1. Provide locks at all drawers, single doors and on active leaf of paired doors.
 2. Provide 2 keys for each lock.
 3. Coordinate locks and latches specified below. At pairs of doors, active leaf shall have lock and inactive leaf shall have elbow catch.
 4. Exposed finishes will be selected from manufacturer's standard finish options.
 5. Keying: Assist Owner with developing a key schedule for drawer locks when shop drawings are reviewed. Coordinate with keying requirements specified in Section 08 7100 "Door Hardware".
- H. Grommets for Cable Passage through Countertops: 3-1/3-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage except as noted otherwise. Color Selected by the Architect from manufacturers standard colors.
1. Manufacture: Doug Mockett & Co, or approved equal.
- I. Other Hardware: ANSI/BHMA Grade 1, types as required for cabinet configurations shown, finish as selected. Key sliding glass cabinet door locks to match those for wood doors.
- J. Casework Hardware Finish: ANSI/BHMA A 156.18.
1. Exposed Hardware (Guest Rooms, Public Areas & Staff Administrative Areas): Dark bronze anodized, oil-rubbed bronze and similar finishes as selected by Architect from manufacturer's full range.
 2. Concealed Hardware (including concealed hinges): Polished or satin chrome or brushed stainless steel. Manufacturer's standard finish.

2.14 PLASTIC-COUNTERTOPS

- A. Type specified in Section 12 3623.

2.15 MIRROR FRAMES

- A. Refer to drawings
- B. Fabricate Mirror Frames as detailed on drawings to sizes indicated in related Section 08 8300 "Mirrors".
1. Frame molding profiles as detailed, trim and casing materials for opaque and transparent finish as specified in related section 06 2023.
 2. Include backerboard of panel materials as specified in this section.

3. Include z-clip hangers as specified in this section.
4. Finishes: As indicated on Drawings and specified in related sections of Division 09.

2.16 DIP OR SPRAY FIRE RETARDANT FOR FINISH TRIM

- A. Shop or field applied Dip or Spray Fire Retardant For Finish Trim.
 1. Refer to Section 06 0573 for items at locations required to have Class B and Class C ratings.

2.17 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Division 09 painting Sections for finishing opaque-finished architectural woodwork.
- D. General: Drawings indicate items that are required to be shop finished. Finish such items at fabrication shop as specified in this Section. Refer to Division 09 painting Sections for finishing architectural woodwork not indicated to be shop finished.
- E. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to Division 09 painting Sections for material and application requirements.
- F. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
- G. Transparent Finish:
 1. Grade: Premium
 - a. Unless indicated otherwise in drawings.
 2. Finish:
 - a. Refer to drawings.
 3. AWI Finish: Conversion varnish.
 4. Staining: Match Architect's sample.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 -inch in 96 -inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 -inches (900 mm) long, except where shorter single-length pieces are necessary.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 -inch in 96 -inches (3 mm in 2400 mm).
 - 4. For trim finishing against walls or ceilings, mill with extra width and scribe to wall or ceiling at job.
 - 5. Hand sand smooth installed millwork ready for finish. Edges to be slightly rounded – remove machine and tool marks.
- H. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 -inch in 96 -inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 -inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 2. Install countertops with no more than 1/8 -inch in 96 -inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at 16 -inches (400 mm) o.c. and to walls with adhesive.
 4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- J. Slat Wall Panels: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless covered by trim.
1. Install flush paneling with no more than 1/16 -inch in 96-inch (1.5 mm in 2400-mm) vertical cup or bow and 1/8 -inch in 96 -inch (3 mm in 2400-mm) horizontal variation from a true plane.
 2. Finish veneer to match approved samples.
- K. Framed Mirrors: Install with Z-Clips and swivel hangers as specified in Section 08 8300.
- L. Framed Chalkboards: Install with Z-Clips and swivel hangers as specified in Section 08 8300.
- M. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- N. Railings:
1. General:
 - a. Refer to drawings.
 - b. Install rails with no more than 1/8 -inch in 96-inch (3 mm in 2400-mm) variation from a straight line.
 2. Stair Rails: Glue and dowel or pin balusters to treads and railings, and railings to newel posts.
 3. Wall Rails: Support rails on indicated metal brackets securely fastened to wall framing.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semi exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

- END OF SECTION -

- SECTION 06 4200 -

WOOD PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Board paneling.
 - 2. Flush wood paneling.

1.3 RELATED REQUIREMENTS

- A. Section 06 0573 "Wood Treatment" for fire retardant wood treatment requirements.
- B. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling and that are concealed within other construction before paneling installation.
- C. Section 06 2000.01 "Finish Carpentry (Courtyard)"
- D. Section 06 2000.02 "Finish Carpentry (Residence Inn)"
- E. Section 06 4023 "Interior Architectural Woodwork" for wood trim installed on or next to stile and rail wood paneling.
- F. Section 09 9123 "Interior Painting"
- G. Section 09 9123.13 "Interior Painting Schedule"
- H. Section 09 9300 "Staining and Transparent Finishes"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Paneling includes wood furring, blocking, and shims for installing paneling, unless concealed within other construction before paneling installation.

1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including finishing materials and processes.
- B. Product Data: For panel products, high-pressure decorative laminate, adhesives and fire-retardant-treated materials.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- C. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections. Note all furring spaces over 1.75 -inches deep and provision for Class A finish materials as required by code.
 - a. Refer to Section 06 0573 "Wood Treatment".
 - 3. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
 - 4. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 - 5. Apply WI-certified compliance label to first page of Shop Drawings.
- D. Samples for Initial Selection:
 - 1. Shop-applied transparent finishes.
 - 2. High-Pressure decorative laminates where indicated.
- E. Samples for Verification:
 - 1. Lumber for transparent finish, not less than 5 -inches (125 mm) wide by 36 -inches (900 mm) long, for each species and cut, finished on one side and one edge.
 - 2. Veneer leaves representative of and selected from flitches to be used for transparent-finished paneling.
 - 3. Veneer-faced panel products for transparent finish, 12 -inches by 24 -inches (300 by 600 mm), for each species and cut.
 - a. Include at least one face-veneer seam and finish as specified.
 - 4. Corner pieces for stile and rail paneling, 18 -inches (450 mm) high by 18 -inches (450 mm) wide by 6 -inches (150 mm) deep.

5. Plastic laminates, 8 –inches by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Fabricator.
- B. Product Certificates: For each type of product.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates .
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.9 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 1. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling and interior architectural wood work with sequence-matched wood veneers and wood doors faced with veneers from same flitches as paneling.
- D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of paneling indicated for construction, finishes, installation, and other requirements.
 1. Provide WI-certified compliance labels and certificates indicating that paneling, including installation, complies with requirements of grades specified.
- E. Quality Standard: Unless otherwise indicated, comply with WI's "Manual of Millwork" for grades of paneling indicated for construction, finishes, installation, and other requirements.
 1. Provide WI-certified compliance labels and certificates indicating that paneling, including installation, complies with requirements of grades specified.
- F. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- G. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

- H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of typical paneling as shown on Drawings.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" or "Project Conditions" Article.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between 60 deg F and 90 deg F (16 and 32 deg C) and relative humidity between 25 percent and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.12 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Composite Wood products must meet current Composite Wood Formaldehyde Limits as specified in Section 01 6116.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to exact compliance with requirements, provide products meeting design requirements and as specified
 - 1. Refer to Drawings.
- B. Basis-of-Design Product:
 - 1. Refer to Drawings.
 - 2. Rooms designated on Interiors Drawings: Provide products, colors and finishes as designated on Interiors Drawings and Interiors Finish Schedule.
 - 3. All other locations: As indicated on the Architectural Drawings and Architectural Finish Schedule or, if none are shown, as specified in this section.

2.3 PANELING FABRICATORS

- A. Source Limitations: Unless otherwise approved by Architect, engage a qualified woodworking firm to assume undivided responsibility for production of paneling.

2.4 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of wood paneling (wall surfacing) indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that paneling and installation complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.5 MATERIALS ("WD-**")

- A. Materials, General:
 - 1. Provide materials that comply with requirements of AWI's quality standard for quality grade specified, unless otherwise indicated.

- B. Wood Moisture Content: 5 percent to 10 percent.
- C. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
- D. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

2.6 FIRE-RETARDANT-TREATED MATERIALS

- A. If concealed blocking spaces for paneling or wainscots exceed 1.75 -inches in depth, provide finish materials that either meet, or are treated to meet, NC IBC Class A requirements.
 - 1. Refer to Section 06 0573 "Wood Treatment".
- B. Fire-Retardant-Treated Materials, General: As specified in Section 06 0573 "Wood Treatment" and as follows; Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 - 1. Use treated materials that comply with requirements of referenced woodworking standard.
 - a. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes.
 - a. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPAC20 (lumber) and AWPAC27 (plywood). Use the following treatment type:
 - 1. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln drying.
 - 2. Kiln-dry materials before and after treatment to levels required for untreated materials.
 - 3. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
- D. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
 - 1. For panels 3/4 -inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2070 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1110 and 1000 N), respectively.
 - 2. For panels 13/16 to 1-1/4 -inches (20 to 32 mm) thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1720 MPa); linear expansion, 0.50 percent; and

screw-holding capacity on face and edge, 250 and 175 lbf (1110 and 780 N), respectively.

3. Product: Subject to compliance with requirements without urea-formaldehyde.

- E. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div or approved alternative.

2.7 DIP OR SPRAY FIRE RETARDANT FOR FINISH TRIM

- A. Shop or field apply Dip or Spray Fire Retardant for Finish Trim specified in Section 06 0573 for items at locations required to have Class B rating.

2.8 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, Fire-retardant-treated where indicated, kiln dried to less than 15 percent moisture content.

- B. Wall panel hanging clips were required for removal.

1. Application: Wall hanging clips (in pairs)
 - a. General:
 - 1) Mfgr: Brooklyn Hardware Manufacturing, www.panelclip.com
 - 2) Material: AA 6063-High Strength, heat treated to T6 hardness
2. Products:
 - a. Panelclip®: (Standard conditions)
 - 1) Sizes:
 - a) Each half: 1-3/4 -inch wide.
 - b) Fully engaged both pieces: 3 1/16 -inch width
 - c) Thickness: 1/4 -inch
 - 2) Holes:
 - a) Diameter: 7/32 -inch
 - b) Spacing: 1 3/4 -inch o.c.
 - 3) Lengths: 12 -feet -0 -inch standard
 - a) Custom lengths as required to meet job conditions
 - 4) Lift clearance: 7/16 -inch
 - 5) Fastening: #10 pan head stainless steel screws
 - b. Kingclip®: (heavy weight as required by Mfgr.)
 - 1) Sizes:
 - a) Each half: 2-3/8 -inch wide.
 - b) Fully engaged both pieces: 4 -inch width
 - c) Thickness: 13/32 -inch
 - 2) Holes:

- a) Diameter: 7/32 -inch
 - b) Spacing: 2 -inch o.c.
 - 3) Lengths: 12 -feet -0 -inch standard
 - a) Custom lengths as required to meet job conditions
 - 4) Lift clearance: 13/16 -inch
 - 5) Mounting channel: 1/4 -inch deep by 1 -inch wide as portion of lower clip.
 - 6) Fasteners: Anchor bolts
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.
- 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of walls and elsewhere as required for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
 - 3. Provide metal expansion sleeves or expansion bolts for post-installed anchors.

2.9 FABRICATION, GENERAL

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
- 1. Lay out one elevation at a time if approved by Architect.
 - 2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.
 - 3. Provide lighting of similar type and level as that of final installation for viewing layout, unless otherwise approved by Architect.
 - 4. Rearrange paneling as directed by Architect until layout is approved.
 - 5. Do not trim end units and other nonmodular size units to less than modular size until after Architect's approval of layout. Indicate trimming by masking edges of units with nonmarking material.
 - 6. Obtain Architect's approval of layout before start of assembly.
 - a. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.
- D. Complete fabrication, including assembly and finishing, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- 1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check

WOOD PANELING

measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

- E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.10 MATERIAL, BOARD PANELING FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Wood Species and Cut:
 - 1. Refer to Drawings.
- C. Pattern:
 - 1. Refer to Drawings.
- D. Shop assemble board paneling into largest units that can be delivered into installation areas using permanent or temporary backing members as indicated.
 - 1. To maximum extent possible, fabricate units in sizes determined by field measurements of existing conditions and that will avoid fitting in the field; make provision for separate scribing pieces to be fitted to adjoining finished surfaces.
 - 2. Provide shop-prepared detachable pieces for forming joints with other units at Project site and with other types of architectural woodwork.
 - 3. Provide shop-prepared detachable joints for necessary field connections.
 - 4. Sand and pull joints tight in shop so field joints will comply with joint tolerances for specified grade.
 - 5. Unless otherwise indicated, provide continuous mortise-and-tenon joints between panel units and provide removable temporary protection for joints during handling and delivery.
 - 6. Outside Corner of Stile and Rail Paneling:
 - a. Shop prepare using lock-mitered or mitered-and-splined construction.
 - b. Assemble, sand, and glue in shop if site conditions permit.

2.11 FLUSH WOOD PANELING FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Wood Species and Cut:
 - 1. Refer to Drawings.
 - 2. Lumber Trim and Edges: At paneling fabricator's option, trim and edges indicated as solid wood (except moldings) may be either lumber or veneered construction of same species and cut as panel faces and compatible with grain and color of panel faces.
- C. Matching of Adjacent Veneer Leaves:
 - 1. Refer to Drawings.
- D. Matching within Panel Face:

1. Refer to Drawings.
- E. Panel-Matching Method: within each separate area
 1. Sequence-matched, uniform-size sets
- F. Vertical Panel-Matching Method:
 1. Refer to Drawings.
- G. Panel Core Construction:
 1. Fire-retardant particleboard or fire-retardant, medium-density fiberboard.
- H. Exposed Panel Edges:
 1. Solid wood or wood veneer matching faces.
- I. Panel Reveals:
 1. Refer to Drawings for conditions.
- J. Fire-Retardant-Treated Paneling: Provide panels consisting of wood-veneer and fire-retardant particleboard or fire-retardant, medium-density fiberboard.
 1. Panels shall have a flame-spread index of 0 - 25 or less and a smoke-developed index of 0 - 450 or less per ASTM E 84.
 - a. Refer also to Section 06 0573 "Wood Treatment"
- K. Provide paneling of thickness shown or, if not shown, **3/4-inch (19-mm)** minimum thickness. Assemble by gluing and concealed fastening.

2.12 SHOP FINISHING

- A. Grade: Provide finishes of same grades as paneling to be finished.
- B. General: Finish paneling at fabrication shop as specified in this Section.
 1. Defer only final touchup, cleaning, and polishing until after installation.
- C. General: Shop finish painted and transparent-finished paneling at fabrication shop as specified in this Section.
 1. Section 09 9123 "Interior Painting" for finishing of opaque-finished paneling.
 2. Section 09 9123.13 "Interior Painting Schedule" for schedule of opaque-finished paneling.
 3. Section 09 9300 "Staining and Transparent Finishing" for material and application requirements.
- D. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished paneling specified to be field finished.
 1. Section 09 9123 "Interior Painting" for material and application requirements.
 2. Section 09 9300 "Staining and Transparent Finishing" for material and application requirements.

- E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 - 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling. Concealed surfaces of plastic-laminate-clad paneling do not require backpriming when surfaced with plastic laminate.
- F. Transparent Finish:
 - 1. Grade: Premium.
 - 2. System:
 - a. WI Finish System 4: Conversion varnish.
 - 3. Staining:
 - a. Match Architect's sample.
 - 4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 5. Sheen: (gloss units measured on 60-degree gloss meter per ASTM D 523.)
 - a. Satin, 31-45
 - 6. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess.
 - a. Tint filler to match stained wood.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with same grade as paneling to be installed.
- B. Install paneling level, plumb, true, and straight with no distortions.
 - 1. Shim as required with concealed shims.
 - 2. Install level and plumb to a tolerance of 1/8 -inch in 96 -inches (3 mm in 2400 mm).
 - 3. Install with no more than 1/16 -inch in 96-inch (1.6 mm in 2400-mm) vertical cup or bow and 1/8 -inch in 96 -inch (3 mm in 2400-mm) horizontal variation from a true plane.
 - 4. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/16 inch (1.5 mm).

- C. Scribe and cut paneling to fit adjoining work refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor paneling to supporting substrate with concealed panel-hanger clips, splined connection strips, or blind nailing as indicated in drawings and reviewed acceptable in shop drawings.
 - 1. Do not use face fastening unless covered by trim.
- E. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling.
 - 1. Fill nail holes with matching filler where exposed.
 - 2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.
- F. Refer to Section 09 9123 "Interior Painting"
- G. Refer to Section 09 9300 "Staining and Transparent Finishing" for final finishing of installed paneling.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate functional and visual defects; where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

- END OF SECTION -

- SECTION 06 6113 -**CULTURED MARBLE FABRICATIONS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cast Polymer
 - a. Tub and Shower Surrounds
 - b. Shower Pans
 - c. Related accessories

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 1053 "Miscellaneous Rough Carpentry"
- C. Section 06 2023 "Interior Finish Carpentry"
- D. Section 09 2900 "Gypsum Board"
- E. Section 12 3000 "Architectural Woodwork"
- F. Division 22 for Plumbing Fixtures

1.4 REFERENCES

- A. California Code of Regulations, Title 24, Part 2, California Building Code (CBC), International Building Code 2009, with 2010 California Amendments.
- B. American National Standards Institute (ANSI)
 - 1. ANSI Z-124.1 American National Standard for Plastic Fabrications.
- C. [ASTM International \(ASTM\)](#) Publications:
 - 1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

- D. [Architectural Woodwork Institute \(AWI\)](#) Publications:
 - 1. "Architectural Woodwork Quality Standards"
- E. [Federal Specifications \(FS\)](#) Publications:
 - 1. FS MMM-A-130 - Adhesive, Contact
- F. NFPA 101 Code for Safety from Fire in Buildings and Structure.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
 - 1. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.
 - a. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.6 QUALITY ASSURANCE

- A. Tub/Shower surrounds, window stools, and lavatory/vanity countertops shall be supplied by one manufacturer.
 - 1. Where shown to be the same color, the color of the components shall match for all items.
 - 2. Refer to Interior Finish Index for colors.
 - 3. Refer to Drawings.
- B. Allowable Tolerances:
 - 1. Variation in component size: +/- 1/8 -inch.
 - 2. Location of openings: +/- 1/8 -inch from indicated location.
- C. Perform work to (custom) quality in accordance with "Quality Standards" of the Architectural Woodwork Institute ([AWI](#)).
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cast polymer materials until painting and similar operations that could damage synthetic marble have been completed in installation areas.

1. If cast polymer materials must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cast polymer materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cast polymer materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Locate concealed framing, blocking, and reinforcements that support cast polymer materials work by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.9 SPECIAL WARRANTY

- A. Cast polymer materials:
 1. Provide one (1) year Warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 1. Avendra, LLC Preferred Manufacturers:
 - a. Simulated Tile Tub/Shower Surrounds and Shower Pans:
 - 1) None.
 2. Approved Manufacturers:
 - a. Simulated Tile Tub/Shower Surrounds and Shower Pans:
 - 1) [Mincey Marble Manufacturing Co.](#) (800-533-1806)
 - 2) [Imperial Marble Corporation](#) (815-498-2303)
 - 3) [MPL Corporation](#) (317-835-9000)
- B. Basis of Design:
 1. **COURTYARD:**
 - a. Mincey Marble, Refer to Drawings, including, but not limited to ID.05 (ST-3)
 2. **RESIDENCE INN:**
 - a. Mincey Marble, Refer to Drawings, including, but not limited to ID.05 (ST-4)

2.2 MATERIAL, CAST POLYMER:

- A. Manufacturers:
 - 1. Avendra, LLC Preferred Manufacturers:
- B. Fire Hazard Ratings:
 - 1. Classified in accordance local codes and ordinances, [ASTM](#) E84 and the following:
 - a. Class A
 - b. Flame Spread:
 - 1) Class A: 0 - 25
 - c. Smoke Developed: 0-450
 - 2. Subject to compliance with requirements, all products shall be permanently marked on the back side and provided with a temporary removable label on the front side with language clearly certifying compliance with [ASTM](#) E84 and indentifying the required Flame Spread Class Rating.
- C. Tub/Shower Surrounds:
 - 1. Homogeneous minimum **1/4 -inch** thick molded panels. Surrounds to be cast polymer wall panels; installed as indicated on Drawings.
 - a. Assembly:
 - 1) No horizontal seams or trim strips permitted.
 - 2) Provide one piece for each wall.
 - 3) Joints will be permitted at corners only.
 - 4) Sizes as shown on Drawings.
 - 5) Color as shown on Interior Finish Index.
 - b. Surround Pattern:
 - 1) Provide custom pattern as shown on Drawings and Interior Finish Index.
 - c. Provide required ceramic soap dishes, in same color as wall panels.
 - 1) Provide soap dishes in locations, configurations, and sizes as shown on Drawings.
 - a) If not shown on Drawings, allow for one at eah shoer and location to be confirmed by Architect.
- D. Shower Pan:
 - 1. Homogeneous solid one piece molded construction with abrasion resistant gel coat surface, sealed textured non-slip finish surface.
 - a. Assembly:
 - 1) Integral Curbs.
 - 2) Separate fiberglass flange
 - 3) **3 1/2 -inch** by **4 -inch** high front curb.
 - 4) No horizontal seams or trim strips permitted.
 - 5) Provide with hole for drain supplied under Division 22
 - 6) Sizes as shown on Drawings.
 - 7) Color as shown on Interior Finish Index.

2.3 INSTALLATION MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- B. Adhesive and Sealant (Installer to verify products are approved by Cast polymer materials Manufacturer):
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. "OSI SF400"; [OSI Sealants, Inc.](#) (800-999-8920)
 - 1) VOC Content: <50 g/L
 - a) Refer also to Section 01 6113 for more restrictive requirements.
 - b. "PL Premium 'Polyurethane' Adhesive"; [OSI Sealants, Inc.](#) (800-999-8920)
 - 1) VOC Content: <50 g/L
 - a) Refer also to Section 01 6113 for more restrictive requirements.
 - c. "LN-902 Liquid Nails", [Liquid Nails](#), Macco Division of ICI Paints, (800-634-0015)
 - 1) VOC Content: <20 g/L
 - a) Refer also to Section 01 6113 for more restrictive requirements.
 - d. "DAP 27404", [DAP, Inc.](#) (888-327-8477)
 - 1) VOC Content: <12.1 g/L
 - a) Refer also to Section 01 6113 for more restrictive requirements.
 - e. Or as recommended by cast polymer manufacturer.

2.4 FABRICATION

- A. General:
 - 1. Shop assemble cast polymer materials for delivery to site in units easily handled and to permit passage through building openings.
 - 2. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.
 - a. Rout and finish component edges with clean, sharp returns.
 - b. Rout cutouts, radii and contours to template.
 - c. Smooth edges.
 - d. Repair or reject defective and inaccurate work.
 - 3. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.
 - 4. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.
 - 5. Provide for mounting of soap dishes, grab rails, etc., as indicated on the Drawings.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify adequacy of backing and support framing.

3.2 PREPARATION

- A. Condition cast polymer materials to average prevailing humidity conditions in installation areas before installation.

3.3 INSTALLATION

- A. All surrounds shall be installed as shown on Drawings and as specified by manufacturer.
- B. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- C. Tub/Shower Surrounds:
 - 1. Install in accordance with manufacturer's recommendations.
 - 2. Remove all dust and other contaminants from the back side of all panels before installation.
 - 3. Secure soap dishes to panels with adhesive as recommended by Manufacturer.
 - 4. Hold bottom edge of wall panel above rim of tub and shower for application of sealant as shown on Drawings.
 - 5. Plumber shall install all plumbing piping and fixtures.
 - 6. All penetrations through wall panels shall be sealed watertight with backer rod and sealant.
 - a. Refer to Division 7 Joint Sealants
- D. Shower Pans:
 - 1. Install in accordance with manufacturer's recommendations.
 - 2. Float the floor to provide substrate prior to installation.
 - 3. Remove all dust and other contaminants from the floor before installation.
 - 4. Plumber shall install drain to pan and set pan in place.
 - 5. Install separate flange if unit does not come with an integral flange.
 - 6. Wall substrate shall stop 1/4 -inch short of top of pan flange.
 - 7. At fire rated walls the first layer of wall sheathing shall extend past the top of flange to floor substrate.
 - 8. Tub/Shower surrounds shall be installed after pan is installed in accordance with manufacturer's written instructions for water tight assembly.

3.4 ADJUSTING AND CLEANING

- A. Keep components clean during installation. Remove adhesives, sealants and other stains.
 - 1. Keep clean until Date of Substantial Completion.
 - a. Replace stained and damaged components.
- B. Protect surfaces from damage until Date of Substantial Completion.
 - 1. Repair work or replace damaged work which cannot be repaired to Owner's Representative's satisfaction.

- END OF SECTION -

- SECTION 06 8200 -

**GLASS FIBER REINFORCED PLASTIC (FRP)
(COURTYARD)**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiber reinforced plastic (FRP) panels.
 - 2. Accessories.
 - 3. Adhesives.
 - 4. Sealants for use with FRP panels.

1.3 RELATED REQUIREMENTS

- A. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- B. Section 07 9200 "Joint Sealants".
- C. Section 09 2116.23 "Gypsum Board Shaft-Wall Assemblies".
- D. Section 09 2900 "Gypsum Board".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [ASTM International \(ASTM\)](#) Publications: (Former American Society for Testing and Materials)
 - 1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings:
 - 1. Show locations and panel layouts; materials and finishes; panel size, thickness and color.
 - 2. Trim locations and types.
 - 3. Anchorage type and spacing.
 - 4. Installation methods; joint treatments; relationships with adjacent construction; and other pertinent information.
- F. Samples: Each product specified.

1.6 QUALITY ASSURANCE

- A. Reference Standards: Applicable requirements of standards and specifications referenced herein apply to the Work of this Section.
- B. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver materials to job site in unopened containers bearing manufacturer's name and content identification.
- C. Store materials as recommended by the manufacturer.
- D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.8 PROJECT CONDITIONS

- A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.
- B. Environmental Limitations: Do not deliver or install Fiber reinforced plastic (FRP) panel materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
 - 1. Acclimatize panels 48 to 72 hours prior to installation.
- C. Field Measurements: Where Fiber reinforced plastic (FRP) panel materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support Fiber reinforced plastic (FRP) panel materials work by field measurements before being enclosed and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. "FRP-1" "Glasbord FSI"; [Crane Composites, Inc., A Crane Co. Company](#) (Formerly Kemlite Co.) (800-435-0080)
 - 2. "FRP-2" "Marlite FRP"; [Marlite](#) (330-343-6621)

2.3 MATERIALS

- A. Fiberglass Reinforced Polyester Panels:
 - 1. Flat with embossed pebble surface texture; moisture resistant and impervious to mold and mildew, conforming to Fedspec L-P-505 and PS53.
 - 2. USDA approved.
 - 3. Meet FDA requirements.
 - 4. Surface Burning Characteristics: [ASTM](#) E84, Class A/I.
 - a. Flame Spread: 25 or less.

- b. Fuel Contributed: 100 or less.
- c. Smoke Developed: 100 or less.
- 5. Size: 0.090 -inch (3/32) thick by 4 -feet by 8 -feet.
- 6. Color: As shown on Interior Finish Specification Drawing.
- 7. Model: As shown on Interior Finish Specification Drawing.

2.4 ACCESSORIES

- A. Moldings:
 - 1. PVC trim moldings by panel manufacturer.
 - 2. Include inside and outside corners, end caps, cap edging, and division bars.
 - 3. Color to match panels.
- B. Anchors
 - 1. Manufacturer's standard nylon drive rivets suitable for anchoring to substrate shown on Drawings.

2.5 ADHESIVE

- A. Type recommended by panel manufacturer.

2.6 SEALANT

- A. Clear silicone sanitary sealant type recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas in which work is to be performed. Report in writing to General Contractor all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting work constitutes acceptance of the existing conditions.

3.2 PREPARATION

- A. Surface preparation:
 - 1. Surface to which panels are to be applied must be smooth, solid.
 - 2. Clean surface of dirt, dust, grease or other matter which might interfere with adhesive bonding of panels to substrate.
- B. Pre-Sizing:
 - 1. Prefit each panel before installing.
 - 2. Cut as required to closely and neatly fit obstructions, nonstandard panel spacing, and penetrations.

GLASS FIBER REINFORCED PLASTIC (FRP) (COURTYARD)

3. Maintain **1/8 -inch** around pipes, electrical fittings, obstructions, and other items penetrating panels, to allow for expansion.

3.3 INSTALLATION

- A. Install panels and moldings in accordance with manufacturer's written instructions.
 1. Adhesive Application:
 - a. Apply adhesive over entire back surface of panel using 3/16" V notched trowel.
 - b. Adhesive coverage: **60 sq.-feet** per gallon, or;
 2. Cohesive Method:
 - a. Skim coat adhesive on panel back and substrate.
 - b. Fan panel to verify bonding to substrate and adhesive curing time after installation.
- B. Install panels with edges vertical and plumb. Use maximum length pieces for minimum number of end joints.
- C. Predrill panel fastener holes slightly oversize to accommodate panel expansion to contraction.
- D. Secure upper and lower panel ends with nylon drive rivets, or with other non-corroding mechanical fasteners recommended by panel manufacturer.
 1. Space fasteners at **16 -inches** o.c.
 2. Drive fasteners to snug fit, but do not over tighten.
- E. Install and seal trim concurrently with panel installation.
- F. Remove excess sealant during installation, or carefully trim off excess after sealant has cured.
- G. Seal joints and seams between panels or moldings and floor or base, ceiling, walls and penetrations.

3.4 CLEANING

- A. Remove labels, stains, and excess sealant.
- B. Clean panels using materials and methods recommended by manufacturer.

- END OF SECTION -

DIVISION 07 – THERMAL & MOISTURE PROTECTION

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THERMAL & MOSTURE PROTECTION

- SECTION 07 1326 -**SELF-ADHERING SHEET WATERPROOFING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes for below grade waterproofing:
 - 1. Modified bituminous sheet waterproofing, fabric reinforced.
 - 2. Blindsight sheet waterproofing.
 - 3. Molded-sheet drainage panels.
 - 4. Utility penetration seals.
 - 5. Tie-Back covers.
 - 6. Coordination and tie in to waterproofing done under separate contract, Phase 1.
- B. Concrete Foundation Walls Cast Against Permanent Lagging: Integrally Bonded Sheet Waterproofing Membrane.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3000 "Cast-in-Place Concrete" for structural cast-in-place concrete in both vertical and horizontal applications and rigid waterstops.
- C. Section 07 1413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for podium waterproofing materials and installation.
- D. Section 07 4213 "Metal-Faced Composite Wall Panel Assemblies"
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for stainless steel tie in flashing between below grade waterproofing and concrete wall above paving/flatwork.
- F. Section 07 9213 "Exterior Façade Joint Sealants" for joint-sealant materials and installation.
- G. Section 07 9500 "Expansion Control" for plaza- or foundation-wall expansion-joint assemblies that interface with waterproofing.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM Standards as specified, including but not limited to;
 - 1. ASTM C 836.
 - 2. ASTM D 412
 - 3. ASTM D 570.
 - 4. ASTM D 903
 - 5. ASTM D 1876
 - 6. ASTM D 1970.
 - 7. ASTM D 4258.
 - 8. ASTM D 5385.
 - 9. ASTM D 6135.
 - 10. ASTM E 154.
 - 11. ASTM E 96/E 96M

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site, schedule conference after approval of complete submittals.
- B. Agenda:
 - 1. Review Project Specifications and Drawings.
 - 2. Establish installation schedules and sequence.
 - 3. Coordinate work with in-place and subsequent construction.
 - 4. Review forecasted weather and working conditions.
 - 5. Review installation procedures, including:
 - a. Substrate requirements for Project acceptance (curing of concrete surface, form release agents, temperature).
 - b. Surface preparation
 - c. Waterproofing installation.
 - d. Phasing and sequencing requirements.
 - e. Termination, flashing, expansion joint, and penetration requirements.
 - f. Special details.
 - g. Review inspection, testing, and quality control procedures.
 - h. Review protection requirements for construction period beyond waterproofing installation.
 - i. Review acceptable repairs and when damaged work must be replaced.
 - j. Permeable Waterstop Grout Injection Tube system for construction joints.
- C. Conduct tour of areas to be waterproofed and report on surface acceptance, possible problem areas, and recommended remedies.

SELF-ADHERING SHEET WATERPROOFING

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
 - 1. Indicate full extent of section scope, provide project-specific details showing integrations with adjacent materials, assemblies and work in related sections.
- C. Samples: For each exposed product and for each color and texture specified, including the following products:
 - 1. 8-inch by 8-inch (200-by-200-mm) square of waterproofing and flashing sheet.
 - 2. 4-inch by 4-inch (100-by-100-mm) square of drainage panel.
 - 3. Tie-Back Cover assembly.

1.7 INFORMATIONAL SUBMITTALS

- A. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- B. Qualification Data: Applicator's qualification data.
- C. Manufacturer's instructions; include applicable temperature ranges.
- D. Manufacturer's Field Reports: Written results and findings of manufacturer's field services specified in PART 3 Field Quality Control.
- E. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Not less than fifteen (15) years documented experience manufacturing specified waterproofing.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.
 - 1. Acceptable to membrane manufacturer prior to execution of this Contract.
 - 2. Company specializing in application of specified waterproofing.
 - 3. Minimum five (5) years documented experience with specified product.
 - 4. Permeable Waterstop Grout Injection Tube system for construction joints.

- a. Initial installation of grout tubes shall be done under supervision of approved manufacturer's representative.
 - b. Injection of sealing material shall be done by manufacturer's Approved Applicator.
- C. Permeable Waterstop Grout Injection Tube system for construction joints.
 - 1. Components and installation procedures shall be in accordance with manufacturer's printed specifications and recommendations.
- D. Owner reserves right to hire independent waterproofing consultant to review submittals, procedures, and installation.
- E. Certifications: Certify materials shipped to Project site meet membrane manufacturer's published performance standards and requirements of this Specification.
- F. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
 - 1. Build for each typical waterproofing installation including accessories and Tie-Back covers to demonstrate surface preparation, crack and joint treatment, corner treatment, and protection.
 - a. Size: 100 square feet (9.3 sq. m) in area.
 - b. Description: Each type of wall installation.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver products to site, store and protect in accordance with manufacturer's instructions and recommendations.
- C. Do not double stack membrane pallets.
- D. Keep mastics and adhesives in dry area away from flames, sparks and excessive heat.
- E. Store material in dry area out of direct sunlight.
- F. Cover materials and allow for adequate ventilation.
- G. Permeable Waterstop Grout Injection Tube system for construction joints.
 - 1. A sufficient quantity of grout tubes and sealing material shall be stored on site or be readily available prior to starting the work to insure that the work will be continuous from start to completion without delay due to material shortage or unavailability.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply products when surface or ambient temperature is below 40 degrees F unless special low temperature products are used.
 - 2. Do not apply products in any instances where surface temperature is lower than 25 degrees F.
 - 3. Do not apply waterproofing to damp or frozen surfaces or during inclement weather (snow, rain, fog, or mist).
- B. Maintain ventilation as recommended by membrane manufacturer during preparation and application of waterproofing materials.
- C. Do not work or walk on exposed waterproofing membrane. Install permanent protection board immediately to protect membrane during subsequent work operations.

1.11 SEQUENCING

- A. Coordinate and sequence work for the Permeable Waterstop Grout Injection Tube system for construction joints to ensure that tubes are placed and system properly installed before further concrete placement.
- B. Coordinate and sequence work to ensure that construction materials placed against or over waterproofing and protection system will occur within 7 days of membrane installation.
 - 1. Do not expose membrane to ultraviolet rays beyond period of time recommended by system manufacturer.

1.12 WARRANTY

- A. Special Membrane Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.
 - 1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 -inch (1.6 mm) in width.
 - 1. Warranty Period: Ten years from date of Substantial Completion.
- C. Membrane Installer's Special Warranty: Specified form, on warranty form at end of this Section, signed by Installer, covering Work of this Section, for warranty period of two years.
 - 1. Warranty includes removing and reinstalling drainage panels.
- D. Permeable Waterstop Grout Injection Tube system for construction joints.
 - 1. Upon completion of Warranty reports 1, 2, & 3, installation and injection of the grout tubes, provide a five (5) year written guarantee that all work (construction joints) shall be watertight.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers, coatings and primers. Comply with limits specified in Section 01 6116.

2.2 MATERIALS, GENERAL

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.3 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum **60-mil (1.5-mm)** nominal thickness, self-adhering sheet consisting of **56 mils (1.4 mm)** of rubberized asphalt laminated on one side to a **4-mil- (0.10-mm-)** thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
1. Basis for Design: **Bituthene 4000** self adhered waterproofing membrane manufactured by **W. R Grace & Co**, Cambridge, MA tel: (866) 333-3726, web: www.graceconstruction.com. Subject to compliance with requirements, provide one of the following:
 2. Source Limitations: Provide all materials by a single manufacturer.
 3. Sheet Membrane:
 - a. Applied to "positive side".
 - b. Low temperature grade when dictated by temperature at time of application.
 - c. Compatible with water based surface conditioner.
 4. Physical Properties:
 - a. Tensile Strength, Membrane: **250 psi (1.7 MPa)** minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: **300 percent** minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus **20 deg F (minus 29 deg C)**; ASTM D 1970.
 - d. Crack Cycling: Unaffected after 100 cycles of **1/8 -inch (3-mm)** movement; ASTM C 836.
 - e. Puncture Resistance: **40 lbf (180 N)** minimum; ASTM E 154.
 - f. Water Absorption: **0.15 percent** weight-gain maximum after 48-hour immersion at **70 deg F (21 deg C)**; ASTM D 570.
 - g. Water Vapor Permeance: **0.05 perms (2.9 ng/Pa x s x sq. m)** maximum; ASTM E 96/E 96M, Water Method.
 - h. Hydrostatic-Head Resistance: **200 -feet (60 m)** minimum; ASTM D 5385.
 5. Sheet Strips for Concealed Strip Flashings: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

SELF-ADHERING SHEET WATERPROOFING

2.4 BLINDSIDE SHEET WATERPROOFING

- A. Bonded HDPE Sheet for Blindside **Vertical Applications**: Uniform, flexible, multilayered-composite sheet membrane consisting of either a HDPE film coated with a pressure-sensitive adhesive and protective release liner, total **32-mil (0.8-mm)** thickness, or an HDPE film coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total **73-mil (1.9-mm)** thickness; with the following physical properties:
1. Basis of Design:
 - a. Grace Construction Products; **W.R. Grace & Co., Preprufe 160R.**
 - b. Approved Equal, Substitutions: Section 01 2500.
 2. Physical Properties:
 - a. Tensile Strength, Film: **4000 psi (27.6 MPa)** minimum; ASTM D 412.
 - b. Low-Temperature Flexibility: Pass at minus **10 deg F (minus 23 deg C)**; ASTM D 1970.
 - c. Peel Adhesion to Concrete: **5 lbf/in. (875 N/m)** minimum; ASTM D 903, modified.
 - d. Lap Adhesion: **2.5 lbf/in. (440 N/m)** minimum; ASTM D 1876, modified.
 - e. Hydrostatic-Head Resistance: **231 -feet (70 m)**; ASTM D 5385, modified.
 - f. Puncture Resistance: 100 lbf (445 N) minimum; ASTM E 154.
 - g. Water Vapor Permeance: 0.01 perms (0.6 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
 - h. Water Absorption: 0.5 percent maximum; ASTM D 570.
- B. Bonded HDPE or Polyethylene Sheet for Blindside **Horizontal Applications**: Uniform, flexible, multilayered-composite sheet membrane consisting of either an HDPE film coated with pressure-sensitive adhesive and protective release liner, total **46-mil (1.2-mm)** thickness, or a cross-laminated film of low- and medium-density polyethylene, coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total **95-mil (2.4-mm)** thickness; with the following physical properties:
1. Basis of Design:
 - a. Grace Construction Products; **W.R. Grace & Co., Preprufe 300.**
 - b. Approved Equal, Substitutions: Section 01 2500.
 2. Physical Properties:
 - a. Tensile Strength, Film: **2000 psi (13.8 MPa)** minimum; ASTM D 412.
 - b. Low-Temperature Flexibility: Pass at minus **10 deg F (minus 23 deg C)**; ASTM D 1970.
 - c. Peel Adhesion to Concrete: **5 lbf/in. (875 N/m)** minimum; ASTM D 903, modified.
 - d. Lap Adhesion: **2.5 lbf/in. (440 N/m)** minimum; ASTM D 1876, modified.
 - e. Hydrostatic-Head Resistance: **231 -feet (70 m)**; ASTM D 5385, modified.
 - f. Puncture Resistance: **200 lbf (890 N)** minimum; ASTM E 154.
 - g. Water Vapor Permeance: **0.01 perms (0.6 ng/Pa x s x sq. m)** maximum; ASTM E 96/E 96M, Water Method.
 - h. Water Absorption: **0.5 percent** maximum; ASTM D 570.
- C. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

2.5 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Insert specific VOC-limit values in subparagraph below if known; coordinate with products and revise to suit Project.
 - 2. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- E. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer. Grace Bituthene Liquid Membrane.
- F. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
- G. Metal Termination Bars: Aluminum bars, approximately 1 -inch by 1/8 -inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.
- H. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
 - 1. Thickness: 1/8 -inch (3 mm), nominal, for vertical applications; 1/4 -inch (6 mm), nominal, elsewhere.
 - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.
- I. Tie-Back Cover assembly: Two-part cover comprised of ABS Base and Preprufe membrane cover and as follows:
 - 1. Manufacturer: WR Grace
 - 2. Model: Preprufe® Tieback Cover
 - 3. Components: (Each assembly)
 - a. One (1) ABS Base and
 - b. One (1) Preprufe® membrane Cover.
 - 4. Sizes: 6 -inch or 8 -inch as required to properly cover Tie-Back and provide appropriate concrete cover over Tie-Back Cover.
 - 5. Physical Properties: (ABS Base)
 - a. Compression: 7290 lbs/inch².
 - b. Flexural Strength: 7910 lbs/inch².
 - c. Flexural Modulus: 286,000 lbs/inch².
 - d. Impact Strength: 4.5 foot- lbs/inch.
 - e. Tensile Strength: 2000 lbs/inch², minimum.
 - f. Elongation: 1000 percent, minimum.

SELF-ADHERING SHEET WATERPROOFING

- g. Puncture resistance: 177 lbs, maximum.
 - h. Thickness: 25 mil, minimum.
 - i. Peel Adhesion: 5 lbs/inch – width.
6. Attachment:
- a. Attached Base to substrate with stainless steel fasteners.
 - b. Cover the Base and lap onto wall membrane with Preprufe® membrane as recommended by WR Grace.

2.6 MOLDED-SHEET DRAINAGE PANELS

- A. Molded-Sheet Drainage Panel: Comply with Division 33 and Civil Drawings.
- B. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core; and with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).
 - 1. Basis for Design: WR Grace's "Hydroduct 220" and "Hydroduct 660"
 - 2. Approved Equal, Substitutions per Section 01 2500.

2.7 INSULATION (PROTECTION BOARD)

- A. Insulation, General: Comply with Section 07 2100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
 - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Verify that items penetrating waterproofing system are securely installed.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
 - 1. Patch small voids (not larger than fingertip size and 1/4 -inch to 3/8 -inch deep with with a compatible mastic/liquid membrane material approved by the membrane manufacturer.
 - 2. Patching of larger voids, bugholes and/or honeycombed areas with a high quality, non-shrink grout. Grout must be given adequate time to cure prior to application of the primers or membrane.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 -inch (1.6 mm).
- F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.
 - 1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.
 - 1. Detail all inside/outside corners and changes-in-plane prior to the installation of the main field membrane.
 - 2. Install strips of self-adhering membrane centered over properly prepared corners, changes-in-plane and similar conditions. Provide a minimum of 4 -inch to 6 -inches of the detail strip on each surface and greater as specifically required by manufacturer.
 - 3. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135 and as follows:
 - a. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:
 - 4. Changes in Plane: All vertical-to-horizontal and other changes-in-plane should have a 3/4 -inch cant or fillet of manufacturer approved mastic or liquid membrane (i.e. CCW LM 800XL).
 - 5. All penetrations should be detailed in a similar fashion and must provide a proper substrate to support the membrane and underlying detail flashing. For example, the annular space between a pipe sleeve in the concrete or CMU foundation wall and a penetrating pipe/conduit must be properly filled and sealed prior to the application of the detail work and main field of the membrane. The waterproofing system components must never be installed over a void or unsupported condition.

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- H. Tie-In to Horizontal Waterproofing (related section): Tie the horizontal waterproofing membrane into the vertical foundation wall waterproofing membrane. Install CCW 711-90 at the edge of the horizontal slab (with the horizontal hot applied membrane applied over it), cut long enough to extend down vertically, lapping over and adhering to the vertical foundation waterproofing membrane below, minimum laps as detailed and as recommended by membrane manufacturer.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours or if contaminated by dust.
- C. Apply and firmly adhere sheets with hand-roller over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).
- D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.
- E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- F. Seal edges of sheet-waterproofing terminations with mastic.
- G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 -inches (150 mm) beyond repaired areas in all directions.
- I. Tie-Back Covers:
1. Install sheet waterproofing membrane within 2 -inches of tieback as per manufacturers standard installation instructions.
 2. Center the Base over tieback and secure to soil retention system (Shoring) using appropriate stainless steel fasteners.
 - a. Fasteners shall be low profile head type.
 3. Apply Preprufe® Tape centered over the edge of the Base flange and roll firmly to form a tight seal.
 - a. Remove release liner and dispose of.
 4. Position the membrane cover over the base taking care to ensure the cover flange sits flat onto the Preprufe Membrane.

5. Apply Preprufe® Tape centered over the edge of the cover flange and roll firmly to form a tight seal.
 - a. Remove release liner and dispose of.
 6. Preprufe® Tape should overlap onto surfaces of tape, membrane, base, cover, etc. a minimum of 2 -inches.
- J. Immediately install protection course with butted joints over waterproofing membrane.
1. Molded-sheet drainage panels, Insulation drainage panels or Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.
- K. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 BLINDSIDE SHEET-WATERPROOFING APPLICATION

- A. Install bonded blindside sheet waterproofing according to manufacturer's written instructions.
- B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.
- C. Vertical Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.
1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.
 2. Overlap factory edges as recommended by the manufacturer and seal with pressure-sensitive seam tape. Install additional 12 -inch (300 mm) wide strip of detail membrane on backside of seam.
 3. Overlap field edges 6 -inches (150 mm) and bed in Liquid Membrane. Install pressure-sensitive seam tape on concrete side and 12 -inch (300 mm) wide strip of detail membrane on backside.
- D. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.
1. Overlap factory edges as required by the manufacturer and seal with pressure-sensitive seam tape. Install additional 12 -inch (300 mm) wide strip of detail membrane on backside of seam.
 2. Overlap field edges 6 -inches (150 mm) and bed in Liquid Membrane. Install pressure-sensitive seam tape on concrete side and 12 -inch (300 mm) wide strip of detail membrane on backside.
- E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- F. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

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- G. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 -inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.
- I. Tie-Back Covers:
 - 1. Install sheet waterproofing membrane within 2 -inches of tieback as per manufacturers standard installation instructions.
 - 2. Center the Base over tieback and secure to soil retention system (Shoring) using appropriate stainless steel fasteners.
 - a. Fasteners shall be low profile head type.
 - 3. Apply Preprufe® Tape centered over the edge of the Base flange and roll firmly to form a tight seal.
 - a. Remove release liner and dispose of.
 - 4. Position the membrane cover over the base taking care to ensure the cover flange sits flat onto the Preprufe Membrane.
 - 5. Apply Preprufe® Tape centered over the edge of the cover flange and roll firmly to form a tight seal.
 - a. Remove release liner and dispose of.
 - 6. Preprufe® Tape should overlap onto surfaces of tape, membrane, base, cover, etc. a minimum of 2 -inches.

3.5 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
- B. Ensure drainage panels drain to continuous perforated perimeter foundation drain at all footings as recommended in subsoil report. Completely wrap drainage gravel with filter cloth. Connect perimeter drain system at lowest point to discharge point(s), as shown on civil plans.

3.6 INSULATION INSTALLATION

- A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 -inch (19 mm) of projections and penetrations.
- B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.7 INSULATION DRAINAGE-PANEL INSTALLATION

- A. Install insulation drainage panels over waterproofed surfaces; cut and fit to within 3/4 -inch (19 mm) of projections and penetrations.
- B. Ensure that drainage channels are aligned and free of obstructions.
- C. On vertical surfaces, set insulation drainage panels in adhesive or tape applied according to manufacturer's written instructions.
- D. On horizontal surfaces, loosely lay insulation drainage panels according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 FIELD QUALITY CONTROL

- A. Owner will engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.
- B. Prepare test and inspection reports.

3.9 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed work from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

- END OF SECTION -

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WATERPROOFING CONTRACTOR CERTIFICATION

Project Name: _____

Building No./Address: _____

General Contractor: _____

Date of Installation: _____

Waterproofing Manufacturer: _____

WATERPROOFING CERTIFICATION:

As the Waterproofing Subcontractor on this project, I certify that the specified waterproofing system(s) have been installed in accordance with the manufacturer's published criteria, project specifications, and drawings.

Name of Subcontractor's Company: _____

Name of Principal in Subcontractor's Company: _____

Signature of Principal: _____ Date: _____

- SECTION 07 1413 -**HOT FLUID-APPLIED RUBBERIZED ASPHALT
WATERPROOFING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Rubberized-asphalt waterproofing membrane, 215 mil thick, including a polyester reinforcement fabric.
 - 2. Composite Drainage and Protection board ("Drainage Mat").

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Sections 01 4339 "Mockup Requirements".
- C. Section 07 1416 "Cold Fluid-Applied Waterproofing (Swimming Pool)".
- D. Section 07 1326 "Self-Adhering Sheet Waterproofing" for vertical wall waterproofing materials and installation.
- E. Section 07 4213 "Metal-Faced Composite Wall Panel Assemblies".
- F. Section 07 9213 "Exterior Façade Joint Sealants" for joint-sealant materials and installation.
- G. Section 32 1316 "Decorative Cement Concrete Paving" for finishes overlying this section.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- C. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
 - 1. Shop Drawings shall include project-specific details coordination with related finishes and assemblies. Manufacturer standard details alone are not acceptable.
 - 2. Shop drawings must be reviewed and approved by manufacturer prior to submittal to Architect.
- D. Samples: For the following products in manufacturer's standard sizes unless otherwise indicated:
 - 1. Flashing sheet.
 - 2. Membrane-reinforcing fabric.
 - 3. Insulation.
 - 4. Drainage mat panel.
- E. Qualification Data: For qualified Installer.
- F. Product Test Reports: For waterproofing, based on evaluation of comprehensive tests performed by a qualified testing agency.
- G. Field quality-control reports.
- H. Contractor's Certification: Signed copy of certification attached following this section.
- I. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in production of fluid applied rubberized asphalt waterproofing with minimum fifteen (15) years documented experience.
- B. Installer Qualifications: A firm that is approved or licensed by manufacturer for installation of waterproofing required for this Project with a minimum of five (5) years documented experience and is eligible to receive special warranties specified.
- C. Source Limitations: Obtain waterproofing materials, sheet flashings, protection course insulation from single source from single manufacturer.
- D. Mockups: Install waterproofing to 100 sq. ft. (9.3 sq. m) of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution

quality. Install pavers and paver supports to demonstrate aesthetic affects and set quality standards for materials and execution.

1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall overlaying construction until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site following approval of complete submittal.

1. Prior to installation of the waterproofing system, representatives of the following entities are required to meet at the project site: Owner, Consultant, General Contractor, Waterproofing Contractor, Materials Manufacturer and representatives of other entities directly concerned with installation or performance of the waterproofing system.
2. Attendees shall review all pertinent details and specifications, note any potential problems and make any changes, deletions or additions in writing as deemed necessary. Also included in the discussion will be the following: Nature and availability of waterproofing materials, guarantee and submittal requirements, scheduling and forecast weather conditions, regulatory requirements, completed waterproofing system, proposed installation procedures and any additional items related to the total waterproofing system.
3. Where possible, attendees shall tour waterproofing areas and discuss general conditions including waterproofing slope, wall and penetration flashing details, drainage, and materials compatibility.
4. Discussion will be recorded, including agreement or disagreement on matters of significance. All matters in question or disagreements will be resolved in writing prior to commencing any work. A copy of recorded discussion will be furnished to all attendees.
5. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F (minus 18 deg C).
 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.
 - 1. Warranty insulation will retain **80 percent** of original published thermal value.
 - 2. Warranty includes removing and reinstalling protection board, drainage panels, insulation, landscaping and finish paving overburden on plaza decks.
 - 3. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Special Installer's Warranty: Specified form signed by Installer, covering Work of this Section, for warranty period of two years.
 - 1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, and finish paving on plaza decks.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives, sealants, fillers, coatings and primers. Comply with limits specified in Section 01 6116.

2.2 WATERPROOFING MEMBRANE

- A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
 - 1. Basis of Design: The design is based on Monolithic Membrane **MM6125FR**, manufactured by **American Hydrotech, Inc.**, Chicago, IL, tel: (800) 877-6125, website: www.hydrotechusa.com.
- B. Single-component, **100 percent** solids, hot-applied rubberized asphalt, complying with the following as determined by the test method indicated with each property:
 - 1. Flash Point: ASTM D 92. **500 degree F.**
 - 2. Cone Penetration: ASTM D 1191.
 - 3. Flow: ASTM D 1191. **0.0 mm @ 140 F.**
 - 4. Adhesion Rating: Pass;
 - 5. Water Vapor Permeance: **1.6 ng/Paxsq. m**; ASTM E96, Procedure E.
 - 6. Water Absorption: **0.22-g** maximum mass gain.
 - 7. Softening Point: ASTM D 36, **180 F.**
 - 8. Elongation: ASTM D 1191, **1000 percent** minimum.
 - 9. Low Temperature Flexibility (-25C): CGSB-37.50-M89, No cracking.
 - 10. Crack Bridging Capability: CGSB-37.50-M89, No cracking, splitting, or loss of adhesion.
 - 11. Heat Stability: CGSB-37.50-M89; Meet the requirements for penetration, flow, low temperature flexibility, and viscosity when heated for 5 hours at manufacturer's recommended application temperature.

12. Hydrostatic Pressure Resistance: ASTM D-08.22, Draft 2, 100 psi (231 feet head of water).
13. Water Resistance: No delamination, blistering, emulsion, or deterioration after 5 days at 122 degrees Fahrenheit.
14. Bond to Concrete: ASTM D 3407.

2.3 FLASHING SHEET MATERIALS

- A. Elastomeric Flashing Sheet: 50-mil- (1.3-mm-) minimum, uncured sheet neoprene as follows:
 1. Tensile Strength: 1400 psi (9.6 MPa) minimum; ASTM D 412, Die C.
 2. Elongation: 300 percent minimum; ASTM D 412.
 3. Tear Resistance: 125 psi (860 kPa) minimum; ASTM D 624, Die C.
 4. Brittleness: Does not break at minus 30 deg F (34 deg C); ASTM D 2137.

2.4 AUXILIARY MATERIALS

- A. Primer: Surface Conditioner; Zero-VOC, water based, types recommended by membrane manufacturer for conditions indicated.
- B. Rubberized asphalt protection sheet with synthetic fiber reinforcement. "Hydroflex 30".
 1. Thickness: .085 inch; + .005 (85 mils, 2 mm).
- C. Elastomeric Sheet: 50-mil- (1.3-mm-) minimum, uncured sheet neoprene, "Flex-Flash UN" as follows:
 1. Tensile Strength: 1400 psi (9.6 MPa) minimum; ASTM D 412, Die C.
 2. Elongation: 300 percent minimum; ASTM D 412.
 3. Tear Resistance: 125 psi (860 kPa) minimum; ASTM D 624, Die C.
 4. Brittleness: Does not break at minus 30 deg F (34 deg C); ASTM D 2137.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum termination bars; approximately 1 -inch by 1/8 inch (25 by 3 mm) thick; with anchors.
- E. Sealants and Accessories: Manufacturer's recommended sealants and accessories.
- F. Reinforcing Fabric: Manufacturer's recommended, spun-bonded polyester fabric.
- G. Protection Course: Hydroflex 30, 80-mil to 90-mil- (2.0- to 2.3-mm-) thick, fiberglass-reinforced rubberized asphalt or modified bituminous sheet.

2.5 MOLDED-SHEET DRAINAGE PANELS ("DRAINAGE MAT")

- A. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 50 sieve, laminated to one side bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 8.5 gpm/ft.
 1. Hydrodrain 302, 40,000 psf compressive strength.

2.6 SEALANTS

- A. Provide the following types, VOC compliant as specified in 07 9213, as recommended by waterproofing manufacturer.
 - 1. Self-Leveling Sealant: (Self-Leveling Grade): Two-component polyurethane sealant.
 - 2. Gun Grade Sealant: (Gun Grade): Multiple-component high-performance polyurethane sealant.
 - 3. Patching Compounds: single-component, cement-based patching compounds.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
 - 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.
- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

- A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.
 - 1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
 - 2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 -inches (150 mm) on each side of moving joints and cracks or joints and cracks exceeding 1/8 -inch (3 mm) thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
 - 3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 -inches (150 mm) on each side of nonmoving joints and cracks not exceeding 1/8 -inch (3 mm) thick, and beyond roof drains and penetrations.
 - a. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.
- B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric sheet extended a minimum of 6 -inches (150 mm) on each side of joints and adhere to substrates in a layer of hot rubberized asphalt. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.

3.4 FLASHING AT DRAINS

- A. The area around the drains shall be coated with hot rubberized asphalt membrane at a thickness of 1/8 -inch.
- B. Flashing sheet shall be placed over the coated drain flange extending a minimum 12 -inches around the flange.
- C. A second coat of hot rubberized asphalt membrane shall be applied over the flashing sheet at a thickness of 1/8 -inch.
- D. Apply clamping ring exerting sufficient pressure to affect a seal between clamping ring and membrane. Temporarily block all drains during the application of ballast, or other materials that might block the drains. Remove blocking when work is not in progress and upon completion.

3.5 FLASHING INSTALLATION

- A. Install elastomeric flashing sheets at terminations of waterproofing membrane according to manufacturer's written instructions.
- B. Prime substrate with asphalt primer.
- C. Install elastomeric flashing sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.
- D. Extend elastomeric flashing sheet up walls or parapets a minimum of 8 -inches (200 mm) above plaza deck pavers and 6 -inches (150 mm) onto deck to be waterproofed.
- E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of roofing.

- F. Form and install sill dams at door openings as shown.

3.6 MEMBRANE APPLICATION

- A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
- B. Heat and apply rubberized asphalt according to manufacturer's written instructions.
1. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.
- C. Start application with manufacturer's authorized representative present.
- D. Detail and flash corners, joints and penetrations in accordance with manufacturer's standard guideline details prior to applying membrane. Apply uncured neoprene sheet flashing/reinforcing to horizontal-to-vertical transitions, penetrations and terminations.
- E. Reinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to a thickness of 90 mils (2.3 mm); embed reinforcing fabric, overlapping sheets 2 -inches (50 mm); spread another 125-mil (3.2-mm-) thick layer to provide a uniform, reinforced, seamless membrane 215 mils (5.5 mm) thick.
- F. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
- G. Cover waterproofing with protection course with overlapped joints before membrane is subject to construction or vehicular traffic.

3.7 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.8 PLAZA DECK FINISH INSTALLATION

- A. Refer to related Sections for installation requirements.

3.9 FIELD QUALITY CONTROL

- A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of the membrane, flashings, protection, and drainage components; furnish daily reports to Architect.
- B. Leak Detection and Flood Testing: Perform **both** Electronic Leak Detection and Flood Testing in the order described below.
1. Electronic Leak Detection: Owner will engage Testing Agency to perform Electric Field Vector Mapping (EFVM)leak testing of completed membrane. Test each deck area for leaks according to recommendations of EFVM equipment manufacturer.
 - a. Provide written test report with roof plan indicating all located leaks.

HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

- b. Provide photographs of all leaks.
 - c. Table of leak locations.
 - 2. Repair membrane to eliminate leaks and re-test until leak-free performance is obtained.
 - a. Obtain Testing Agency verification of leak repair.
 - 3. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing and protecting membrane roofing but before placing overlaying construction. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - a. Flood to an average depth of 2-1/2 -inches (65 mm,) with a minimum depth of 1 -inch (25 mm) and a maximum depth of 4 -inches (100 mm). Maintain 2 -inches (50 mm) of clearance from top of sheet flashings.
 - b. Flood each area for 48 hours.
 - 4. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.
- C. Owner will engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.10 CLEANING AND PROTECTION

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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WATERPROOFING CONTRACTOR CERTIFICATION

Project Name: _____

Building No./Address: _____

General Contractor: _____

Date of Installation: _____

Waterproofing Manufacturer: _____

WATERPROOFING CERTIFICATION:

As the Waterproofing Subcontractor on this project, I certify that the specified waterproofing system(s) have been installed in accordance with the manufacturer's published criteria, project specifications, and drawings.

Name of Subcontractor's Company: _____

Name of Principal in Subcontractor's Company: _____

Signature of Principal: _____ Date: _____

- SECTION 07 1416 -**COLD FLUID-APPLIED WATERPROOFING
(SWIMMING POOLS)**

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Concrete protection and waterproofing applied on positive side of Swimming Pool and Spa Shell prior to application of finished cementitious coating.

1.2 RELATED SECTIONS

- 1. 03 3719 "Pneumatically Placed Concrete (Swimming Pool)"
- 2. 07 1413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for building waterproofing prior to additional waterproofing specific to swimming pools
- 3. 09 3013 "Swimming Pool Ceramic Tile"
- 4. 09 9723 "Concrete and Masonry Coatings (Swimming Pool)"
- 5. 13 1133 "Elevated Swimming Pool"
- 6. 13 1146 "Swimming Pool Accessories"
- 7. 13 1149 "Swimming Pool Cleaning Equipment"

PART 2 - PRODUCT**2.1 CONCRETE PROTECTION AND WATERPROOFING:**

- A. Concrete Pool Shell Protector CPSP: permanent, clear treatment, preservative, sealant solution for pool shell.
 - 1. AQURON Corporation International; www.aquron.com
 - a. CPSP (Concrete Pool Shell Protector)

PART 3 - EXECUTION

3.1 JOB CONDITIONS:

- A. Do not proceed with application of AQURON® CPSP™ when ambient temperature and/or substrate temperatures are less than 37°F/2.8°C or forecasted to drop below 37°F/2.8°C during the next 6 hours.
- B. AQURON® CPSP™ only seals the concrete itself, not fractures.

3.2 APPLICATION

- A. AQURON® CPSP™ must be applied with a high pressure airless sprayer with spray tip size as follows:
 - 1. Steel Troweled Concrete & Smooth Plaster .013–.015
 - 2. Shotcrete .015–.019
 - 3. Gunitite .019
 - 4. Spray tip fan width should be 10 –inches to –14 -inches wide.
- B. Pre-wet area of application with water to cool concrete that is extremely hot (95°F or higher). All pooled and puddle areas must be dispersed, continue to keep area damp until AQURON® CPSP™ has been applied.
- C. Apply AQURON® CPSP™ at a rate no less than 1 liter to 3.5m2/150 sq. ft. per US gallon. Normally to achieve this rate of application of AQURON® CPSP™ at least 2 applications will be needed. First application covering area in one direction, then applying second application after first has penetrated surface (do not allow first application to dry, apply second application as soon as surface sheen has dissipated). Even coverage is achieved by applying the two applications at 90° to each other; i.e., a crisscross pattern!
- D. Start application holding spray tip approximately eight –inches to 10 –inches (200–300mm) from concrete surface, make application using overlapping spray pattern with a fanning motion at the end of each pass.
- E. Entire area being treated is to be saturated, but do not allow AQURON® CPSP™ to puddle. Disperse puddle areas with broom 15–30 minutes after application is completed (do not allow puddles of AQURON® CPSP™ to dry).
- F. Always start application at lowest possible area and proceed to higher elevations. On vertical application (walls) start at the bottom and proceed up the vertical surface with horizontal and vertical strokes to insure coverage.
- G. When application is to weeping hydrostatic concrete, at least doubling step 3 of the Application Procedure is necessary with the second applied immediately following the first.

- END OF SECTION -

- SECTION 07 1813 -**PEDESTRIAN TRAFFIC COATINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Furnish and install a fully reinforced waterproof pedestrian traffic coating over concrete substrate.
 - a. Adhered, low-odor, cold fluid-applied reinforced (PMMA) polymethyl methacrylate waterproofing system including, penetration flashings, base flashings, surface cracks/voids, control and expansion joints.
 - b. Substrate preparation, cleaning, leveling and patching.
 - c. Temporary waterproofing.
 - d. Flashing installation, field surface membrane strips installation and expansion joint installation.
 - e. Traffic-bearing surfacing installation.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- B. Section 01 4339 "Mockup Requirements".
- C. Section 03 3000 "Cast-In-Place Concrete" for waterproofing membrane substrate.
- D. Section 07 6200 "Sheet Metal Flashing and Trim".
- E. Division 22 "Plumbing" for storm drainage piping specialties for floor drains.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

- B. Manufacturer's recommendations and specifications.
- C. ACI-308 - Recommended Practice for Curing Concrete.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane.
 - 2. ASTM D 638 - Test Methods for Tensile Properties of Plastics.
 - 3. ASTM D 4258 - Standard Practice for Surface Cleaning Concrete for Coatings.
 - 4. ASTM D 4259 - Standard Practice for Abrading Concrete.
 - 5. ASTM D 4541 - Method for Pull-Off Strength of Coatings using Portable Adhesion Tester.
 - 6. ASTM E 96 (A) - Test Methods of Moisture Transmission of Material.
 - 7. ASTM E 108, ANSI/UL 790 for fire resistance.
- E. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.

1.5 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.6 ACTION SUBMITTALS

- A. General: Submit following items in accordance with Section 01 3300 "Submittal Procedures".
- B. Product Data: Provide current standard printed product literature indicating characteristics of membrane materials, flashing materials, components, and accessories product specification and installation.
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Product Samples: Submit product samples of membrane and flashing materials showing color, texture, thickness and surfacing representative of the proposed system for review and approval by the Owner's Representative.
- E. Submit sample copies of both the Manufacturer and Applicator warranties for the periods stipulated.
 - 1. Each specimen must be a preprinted representative sample of the issuing company's standard warranty for the system specified.
 - 2. 8 -inch by 12 -inch minimum size samples of assembly.
- F. Membrane Shop Drawings:
 - 1. Submit shop drawings of cold fluid-applied reinforced polymethyl methacrylate membrane and surfacing/wearing layers showing all a project plan, size, flashing details, and attachment for review.

PEDESTRIAN TRAFFIC COATINGS

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of compliance with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Product Certification: Manufacturer's written statement, signed by manufacturer's executive officer, certifying conformance to provisions of Contract Documents including referenced ASTM and UL Standards.
- E. Evaluation Reports: For components of roofing system, from ICC-ES.
- F. Field quality-control reports.
- G. Manufacturer's Instructions: Include manufacturer's guide specifications, installation requirements, special procedures, and conditions requiring special attention.
- H. Submit copies of current Material Safety Data Sheets (MSDS) for all components of the work.

1.8 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.

1.9 REGULATORY REQUIREMENTS

- A. Conform to applicable building and jurisdictional codes for roofing/waterproofing assembly and fire resistance requirements.
- B. Comply with requirements of OSHA, NIOSH or local governing authority for work place safety.
 - 1. Provide any and all crewmembers with appropriate safety data information and training as it relates to the specific chemical compound he or she may be expected to deal with.
 - 2. Each crewmember shall be fully aware of first-aid measures to be undertaken in case of incidents.
 - 3. Copies of all current MSDS for all components shall be kept on site.

1.10 QUALITY ASSURANCE

- A. Membrane Manufacturer: Company specializing in manufacturing the products specified in this section with ten (10) years documented experience. Membrane Manufacturer shall submit the following certifications for review:
 - 1. Substrates and conditions are acceptable for purpose of providing specified warranty.
 - 2. Materials supplied shall meet the specified requirements.

- B. Applicator: Company specializing in performing the work of this section with three (3) years documented experience and approved by system manufacturer for warranted membrane installation.
 - 1. Applicator shall submit the following certification for review:
 - a. Documentation from the membrane manufacturer to verify contractor's status as an approved applicator for warranted installations.
- C. Evaluate moisture content of substrate materials.
 - 1. Constructor shall determine substrate moisture content throughout the work and record with Daily Inspection Reports or other form of reporting acceptable to the Architect, and Membrane Manufacturer.
- D. Random tests to determine tensile bond strength of membrane to substrate shall be conducted by the Contractor at the job site using an Elcometer Adhesion Tester Model 106 or similar device.
 - 1. Contractor shall perform tests at the beginning of the Work, and at intervals as required to assure specified adhesion with a minimum of three (3) tests per 5000 square –feet or portion thereof.
 - a. Smaller areas shall receive a minimum of three (3) tests.
 - 1) Test results shall be submitted to the Contractor, Architect and Membrane Manufacturer.
 - 2) Contractor shall immediately notify the Architect and Membrane Manufacturer in the event tensile bond test results are below specified values.
 - 2. Adequate surface preparation will be indicated by tensile bond strength of membrane to substrate greater than or equal to 220 psi (1.5 N/mm²) for pedestrian traffic and 300 psi (2.0 n/mm²) for vehicular (low speed) traffic and water flow/containment.
 - a. In the event the tensile bond strengths are lower than the minimum specified, additional substrate preparation is required and shall be performed at no additional cost or time to project.
 - b. Repeat testing to verify suitability of substrate preparation.
- E. Monitor quantities of installed materials. Monitor application of resin mixture, reinforcing fleece and flashing. Perform Work in accordance with manufacturer's instructions.
- F. Mockup areas shall be used to determine required methods and tools to obtain degree of substrate preparation required by the membrane manufacturer. Conduct tests as required to verify that substrate preparation meets specified requirements. Tests shall include, but are not limited to, tensile bond strength and moisture content of substrate.
 - 1. Prepare and clean a 3 -foot (0.9 m) by 3 -foot (0.9 m) area of each substrate material type.
 - 2. Submit findings in writing to Contractor, Architect and Membrane Manufacturer.
 - 3. Mock-up areas shall be maintained for quality control for the entire project.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion and approved by Architect and product representative.
- G. Preinstallation Conference: Convene a pre-installation meeting at Project site one (1) week before starting work of this section. Require attendance of parties directly affecting work of this section, including but not limited to,

PEDESTRIAN TRAFFIC COATINGS

1. Architect, and Owner's Representative, Waterproofing Contractor, and Membrane Manufacturer's Representative.
2. Review waterproof pedestrian traffic coating preparation and installation procedures, coordination and scheduling required with related work, and condition and structural loading limitations of deck/substrate.

1.11 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall define a storage area for all components.
 1. The area shall be cool, dry, out of direct sunlight, and in accordance with manufacturer's recommendations and relevant regulatory agencies.
 2. Materials shall not be stored in quantities that will exceed design loads, damage substrate materials, hinder installation or drainage.
- B. Store solvent-bearing solutions, resins, additives, inhibitors or adhesives in accordance with the MSDS and/or local fire authority.
 1. After partial use of materials replace lids promptly and tightly to prevent contamination.
 2. Materials shall meet VOC requirements as specified.
- C. Roll goods shall be stored horizontally on platforms sufficiently elevated to prevent contact with water and other contaminants.
 1. Do not use rolls which are wet, dirty or have damaged ends.
- D. Waterproofing materials must be kept dry at all times.
 1. If stored outside, raise materials above ground or roof level on pallets and cover with a tarpaulin or other waterproof material.
 2. Plastic wrapping installed at the factory should not be used as outside storage covers.
- E. Follow manufacturer's directions for protection of materials prior to and during installation.
- F. Do not use materials which have been damaged to the point that they will not perform as specified. Fleece reinforcing materials must be clean, dry and free of all contaminants.
- G. Copies of all current MSDS for all components shall be kept on site.
 1. Provide any and all crewmembers with appropriate safety data information and training as it relates to the specific chemical compound he or she may be expected to deal with.
 - a. Each crewmember shall be fully aware of first-aid measures to be undertaken in case of incidents.
 - b. Comply with requirements of OSHA, NIOSH or local governing authority for work place safety.

1.12 PROJECT CONDITIONS

- A. Do not apply waterproofing membrane and/or surfacing/wearing layers during or with the threat of inclement weather.
- B. Application of cold fluid-applied reinforced polymethyl methacrylate waterproofing membrane may proceed while air temperature is between 23 °F and 95 °F (-5 - 35 °C) providing the substrate is a minimum of 5 °F above the dew point.

- C. Application of cold fluid-applied waterproofing surfacing/wearing layers may proceed while air temperature is between 32 °F and 95 °F (0 - 35 °C) providing the substrate is a minimum of 5 °F above the dew point
- D. When ambient temperatures are at or expected to fall below 23 °F (-5 °C) or reach 95 °F (35 °C) or higher, follow Membrane System Manufacturer's recommendations for weather related restrictions and application procedures.
- E. Ensure that substrate materials are dry and free of contaminants.
 - 1. Do not commence with the application unless substrate conditions are suitable.
 - 2. Contractor shall demonstrate that substrate conditions are suitable for the application of the materials.
- F. Contractor shall implement odor control and elimination measures prior to and during the application of the roofing/waterproofing materials. Control/elimination measures shall be field tested at off-hours and typically consists of one (1) or a multiple of the following measures:
 - 1. Sealing of air intakes with activated carbon filters. Install filters in accordance with requirements and recommendations of the filter manufacturer.
 - a. Seal filters at joints and against building exterior walls to prevent leakage of unfiltered air where required due to size of intake opening.
 - b. Provide track system to secure filters.
 - 2. Erection and use of moveable enclosure(s) sized to accommodate work area(s) and stationary enclosure for resin mixing station.
 - a. Enclosure shall be field constructed or pre-manufactured of fire retardant materials in compliance with local code requirements in accordance with requirements of the Owner or his designated Representative.
 - b. Equipment enclosure(s) with mechanical air intake/ exhaust openings and Odor Control Air Cleaners, as required to clean enclosed air volume and to prevent odor migration outside the enclosure.
 - c. Exhaust opening shall be sealed with activated carbon filter.
 - 3. Placement of odor elimination stations inside and outside of the enclosure(s) as required by field condition, in coordination with the Owner or his designated Representative.
 - 4. Protection of Contractor personnel and occupants of the structure and surrounding buildings as necessary to comply with requirements of OSHA, NIOSH and/or governing local authority.
 - 5. When disposing of all refuse or unused materials, observe all EPA, OSHA or local disposal requirements.

1.13 COORDINATION AND PROTECTION

- A. Coordinate the work with the installation of associated metal flashings, accessories, appurtenances, etc. as the work of this section proceeds.
- B. Building components shall be protected adequately (with tarp or other suitable material) from soil, stains, or spills at all hoisting points and areas of application.
 - 1. Contractor shall be responsible for preventing damage from any operation under its Contract.
 - 2. Any such damage shall be repaired at Contractor's expense to Architect's satisfaction or be restored to original condition.

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- C. Provide barricades, retaining ropes, safety elements (active/passive) and any appropriate signage required by OSHA, NIOSH, and NSC and per agency having jurisdiction.
- D. Protect finished waterproofing membrane from damage by other trades.
 - 1. Do not allow waste products containing petroleum, grease, acid, solvents, vegetable or mineral oil, animal oil, animal fat, etc. or direct steam venting to come into direct contact with the membrane.
 - 2. Contact membrane manufacturer for further exposure limitation and restrictions.

1.14 WARRANTY

- A. Manufacturer's Premier Warranty:
 - 1. Provide Twenty (20) Year manufacturer's warranty under provisions of this Section.
 - a. This warranty provides for cost of labor and materials for loss of water tightness, limited to amounts necessary to effect repairs necessitated by either defective material or defects in related installation workmanship, with no dollar limitation ("NDL").
- B. Waterproofing Contractor's Warranty: Provide Five (5) year "Applicator Maintenance Warranty" covering workmanship for all work of this section including installation of membrane, flashings, metal work, and roofing/waterproofing accessories.
- C. Submit two (2) executed copies of both the manufacturer and applicator warranties for the periods stipulated, starting from the date of substantial completion.
 - 1. Each warranty must be signed by an authorized representative of the issuing company.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers, primers, and coatings. Comply with limits specified in Section 01 6116.

2.2 SYSTEM DESCRIPTION

- A. The following specification outlines the requirements for a fully reinforced, quick curing, cold fluid-applied, (PMMA) polymethyl methacrylate liquid resin waterproofing membrane with approved broadcast mineral aggregate surfacing or approved coating and all other ancillary waterproofing work including but not limited to, installation of drains, pipe flashings, penetration flashings, sealants and metal work as specified.
 - 1. All membrane materials shall have a superior coefficient of expansion, to allow for differential movement between the horizontal and vertical surface of the flashed penetration or projection.
 - 2. New membrane system must provide fast-drying primers to allow substrate preparation, priming and membrane application to be completed the same day.
 - 3. The use of cold fluid-applied reinforced (PMMA) polymethyl methacrylate membrane materials will be required for all flashings, field surface dynamic cracks and voids.

4. All decks below occupied and/or heated spaces must be waterproofed using a fully reinforced system.

- B. Source Limitations: Obtain waterproofing system components from a single source and from a single manufacturer.

2.3 MANUFACTURERS

- A. Basis-of-Design:
 1. Wet Conditions: Fully reinforced ALSAN RS 230-RS VRX System as manufactured by Soprema, Inc., www.soprema.us.
 - a. Substitutions: Section 01 2500.

2.4 PEDESTRIAN TRAFFIC COATING

- A. System Description, General:
 1. Fleece reinforcing over entire substrate with Field Resin.
- B. System Components:
 1. Fully Reinforced waterproofing system below Podium and Paver system:
 - a. Layer 1: Alsan VRX Primer at lightweight insulating concrete substrate.
 - b. Layer 2: Alsan RS 230 Field Membrane resin.
 - c. Layer 3: Alsan RS Fleece reinforcing.
 - d. Layer 4: Alsan RS 230 Flash resin (Fleece and resin).
 - e. Layer 5: Alsan RS 230 Field Membrane resin.
 - f. Layer 6: Sopradrain ECO-Vent Drainage Mat.

2.5 MATERIALS

- A. Primer: Alsan VRX Primer, Part A and Part B.
 1. Two-component epoxy primer, solvent-free, 100 percent solids, epoxy resin for use in improving adhesion of membrane to cementitious/masonry substrate surfaces.
 2. VOC Content:
 - a. Part A: 12 g/L.
 - b. Part B: 0 g/L.
- C. Fleece Reinforcing Material: A 360 degree needle punched non-woven 110 g/m² polyester reinforcing fleece used to improve tear strength, puncture resistance, flexural fatigue and crack bridging capabilities while maintaining membrane uniformity. Provide products manufactured and supplied by the following:
 1. Product: Soprema Alsan RS Fleece reinforcement fabric for use in an adhered waterproofing system.
 - a. VOC Content: N/A.
- D. Membrane Resin: Two-component, with catalyst, cold fluid-applied reinforced (PMMA) polymethyl methacrylate white-color waterproofing membrane with a 360 degree needle punched non-woven 110 g/m² polyester reinforcing fleece, for a finished dry film membrane thickness of 0.115 -inch nominal per ply; conforming to ASTM C 836.

PEDESTRIAN TRAFFIC COATINGS

1. Product: Soprema System's Alsan RS 230 Field Resin for use in an adhered waterproofing system.
 - a. Color: As approved by Architect from the following:
 - 1) Traffic White.
 - 2) Pebble Grey.
 - b. VOC Content:
 - 1) Summer: 2.3 g/L.
 - 2) Winter: 2.4 g/L.
 - c. Physical Properties:

Property (Summer Formulation)	Value	Test Method
Color	Pebble Gray	-
Physical state	(Liquid) Cures to solid	-
Nominal thickness (with Alsan RS Fleece)	115 mils	ASTM D 5147 (Sect. 5)
Elongation @ peak load, avg.	55 percent	ASTM D 412 (dumbbell)
Peak load @ 73°F, avg.	809 lbf/in ²	ASTM D 412 (dumbbell)
Tear strength	107 lbf	ASTM D 5147 (Sect. 7)
Shore A hardness, avg.	81	ASTM D 2240
Water absorption, (Method I) (24h @ 73°F)	0.41 percent	ASTM D 570
Water absorption, (Method I)(48h @ 122°F)	1.57 percent	ASTM D 570
Low temperature flexibility	-13°F	ASTM D 5147 (Sect.11)
Dimensional stability (maximum movement)	-0.063 percent	ASTM D 5147 (Sect.10)
Usage time*	15-20 minutes	-
Rainproof after*	30 minutes	-
Solid to walk on after*	60 minutes	-
Overburden may be applied after	3 hours	-
Completely hardened after	3 hours	-
Crack spanning	0.08 inch (2mm)	-
Resistance to temperatures up to (short term)	482°F (250°C)	-
*All times are approximate and depend upon wind, humidity and temperature.		

2.6 FLASHINGS

- A. Application: At flashing conditions such as inside and outside corners, curbs, penetrations, etc. incorporating Fleece flashing and Flash resin.
- B. Flashing Resin: Two-component, with catalyst, cold fluid-applied reinforced (PMMA) polymethyl methacrylate flashing/vertical grade waterproofing membrane with a 360 degree needle punched non-woven 110 g/m² polyester reinforcing fleece, for a finished dry film membrane thickness of 0.115 -inch nominal per ply; conforming to ASTM C 836.
 1. Product: Soprema Alsan RS 230 Flash resin with Fleece reinforcing for use in an adhered waterproofing system.
 - a. Color: Match Field Resin
 - b. VOC Content:
 - 1) Field Summer: 2.3 g/L.
 - 2) Field Winter: 2.4 g/L.
 - c. Physical Properties:

Property (Summer Formulation)	Value	Test Method
Color	Pebble Gray	-
Physical state	(Liquid) Cures to solid	-
Nominal thickness (with Alsan RS Fleece)	115 mils	ASTM D 5147 (Sect. 5)
Elongation @ peak load, avg.	55 percent	ASTM D 412 (dumbbell)
Peak load @ 73°F, avg.	90 lbf/in ²	ASTM D 412 (dumbbell)
Tear strength	107 lbf	ASTM D 5147 (Sect. 7)
Shore A hardness, avg.	81	ASTM D 2240
Water absorption, (Method I) (24h @ 73°F)	0.41 percent	ASTM D 570
Water absorption, (Method I)(48h @ 122°F)	1.57 percent	ASTM D 570
Low temperature flexibility	-13°F	ASTM D 5147 (Sect.11)
Dimensional stability (maximum movement)	-0.063 percent	ASTM D 5147 (Sect.10)
Usage time*	15 minutes	-
Rainproof after*	30 minutes	-
Solid to walk on after*	60 minutes	-
Overburden may be applied after	3 hours	-
Completely hardened after	3 hours	-
Crack spanning	0.08 inch (2mm)	-
Resistance to temperatures up to (short term)	482°F (250°C)	-
*All times are approximate and depend upon wind, humidity and temperature.		

2.7 DRAINAGE MAT

- A. Drainage Composite Material: Polypropylene drainage core of fused, entangled filaments molded into a flexible waffle pattern with a geo-composite fabric bonded to one side.
1. Product: Soprema Sopradrain ECO-Vent Drainage Mat.
 - a. VOC Content: N/A.
 - b. Physical Properties:

Core Property	Value	Test Method
Material	Polypropylene	-
Nominal thickness	0.45 inch	-
Weight	16 oz/sq yd	
Compressive Strength	>30,000 psf	ASTM D 1621 (modified) and ASTM D 4716
Fabric Property	Value	Test Method
Color	Black	
Material	Polypropylene	
Weight	4.5 oz/sq yd	ASTM D 5261
Grab strength	120.0 lbs	ASTM D 4632
Grab elongation	50 percent	ASTM D 4632
Trapezoidal Tear	50.0 lbs	ASTM D 4533
Puncture strength	70.0 lbs	ASTM D 4833
Apparent opening size	70 US Sieve	ASTM D 4751
Flow rate	120.0 gal/min/sq ft	ASTM D 4491
Permittivity	1.8 sec -1	ASTM D 4491

2.8 ACCESSORIES

- A. Jointing Mastic: Solvent-based mastic containing SBS modified bitumen, fibers and mineral fillers, compatible with bituminous materials.
 - 1. Product: Soprema Sopramastic.
 - a. Color: Black.
 - b. VOC Content: 190 g/L.
- B. Surface Leveling/Pitching Mortar Resin: (As required for field conditions and meeting warranty criteria).
 - 1. Material: Multi component, high solids polymethyl methacrylate mortar resin mix for use in leveling, pitching and smoothing deck substrate surfaces. Provide products manufactured and supplied by the following:
 - a. Soprema Alsan RS 233 Self-Leveling Mortar resin for use in an adhered waterproofing system.
 - 1) A mixture of RS 210 Binder Resin and RS 223 Mixing Powder.
 - 2) VOC Content: 0.4 g/L.
 - b. Soprema Alsan RS Repair Mortar resin for use in adhered waterproofing system.
 - 1) VOC Content: 4.5 g/L.
- C. Patching, Filling and Smoothing Resin: (As required for field conditions and meeting warranty criteria)
 - 1. Two-component, high solids polymethyl methacrylate paste resin for use in filling surface cracks, voids and depressions and for smoothing/leveling surfaces prior to application of membrane system.
 - 2. Product: Soprema Alsan RS Paste Resin for use in an adhered waterproofing system.
 - a. VOC Content: 4.4 g/L.
- D. Tools, Accessories, and Cleaners:
 - 1. Supplied and/or approved by membrane manufacturer for product installation.
- E. Cleaning Agent:
 - 1. Product: Soprema Alsan RS Cleaner
 - a. VOC Content: 902 g/L.
- F. Catalyst/Curing Agent:
 - 1. Material: White granular powder, based on dibenzoylperoxide, used as a reactive agent to induce curing of all polymethyl methacrylate resins.
 - 2. Product: Soprema Alsan RS 223 Catalyst Powder and RS 210 Binder Resin for use with all regular-odor polymethyl methacrylate resins.
 - a. VOC Content:
 - 1) RS 223: 0 g/L.
 - 2) RS 210: 0.3 g/L.
- G. Leveling and Patching Aggregate:
 - 1. Material: Silica sand; washed, kiln-dried, and dust-free, suitable for troweling or pourable self-leveling, round grain or angular with the following size specification:
 - a. Voids Less Than 1/4-Inch Depth: (0.4 - 0.8 mm).

- b. Voids 1/4-Inch to 2-Inch Depth: (0.7 - 1.2 mm).
 - c. Mixing Proportions: Ratio of resin to sand at 1:2 by volume or as approved by membrane manufacturer.
- H. Backer Rod: Expanded, closed-cell polyethylene foam designed for use as filler or with cold-applied joint sealant.
- I. Miscellaneous Fasteners: Appropriate for purpose intended and approved by membrane system manufacturer; length required for thickness of material with metal washers; as supplied by membrane manufacturer.
- J. Sealant (Caulking): Single component, non-sag elastomeric polyurethane sealant, as recommended or supplied by membrane manufacturer for use in making airtight and watertight seals where required.
- K. Temporary and Night Sealant: As recommended or required by membrane manufacturer.
- L. Drains: Assembly as approved by membrane manufacturer.
- M. Protection Pads: Non-woven polyester reinforcement and elastomeric bitumen (SBS modified bitumen) walkway membrane used as protection pad at podium pedestal locations.
 - 1. Product: Soprema Soprawalk.
 - a. Color: Black.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work when substrates are ready to receive work.
- B. Verify that substrate work is complete, clean, and dry and installed in accordance with contract documents before beginning installation of sheet products.
- C. Verify substrate openings, curbs, and protrusions through substrate, and reglets are in place and solidly set.
- D. Verify substrate is structurally supported, secure and sound.

3.2 PREPARATION OF SUBSTRATE

- A. Inspect substrates, and correct defects before application of new waterproofing. Fill all surface voids greater than 1/8-inch wide with an acceptable fill material.
- B. The final substrate for waterproofing shall be clean, dry, free of loose, spalled or weak material including coatings, mineral aggregate, and flood coat/gravel surfacing, oil, grease, contaminants, abrupt changes in level, waterproofing agents, curing compounds, and free of projections which could damage membrane materials.
- C. Concrete:

PEDESTRIAN TRAFFIC COATINGS

1. New concrete shall have cured a minimum of 28 days in accordance with ACI-308.
2. New concrete shall be free of oil, grease, curing compounds, loose particles, laitance, friable matter, dirt, and bituminous products.
3. New concrete shall be dry with maximum moisture content of 6 percent.
 - a. Determinations of moisture content shall be performed by the Contractor.
 - 1) Contractor shall be responsible to perform periodic evaluations of moisture content during the work.
 - b. Moisture evaluation results shall be submitted in writing to the Contractor, Architect and Waterproofing manufacturer for acceptance.
4. Where the substrate moisture content exceeds acceptable levels, or where moisture migration to the area below the membrane application cannot be positively eliminated.
 - a. Contractor may utilize an approved thixo agent / quartz mix primer or epoxy primer in lieu of the polymethyl methacrylate primer.
 - b. The use of thixo agent / quartz mix primer and epoxy shall be contingent on the written approval by Waterproofing Manufacturer's Technical Department.
5. Where required, concrete shall be abrasively cleaned in accordance with ASTM D 4259 to provide a sound substrate free from laitance with an open concrete surface. When using mechanical methods to remove existing waterproofing products or surface deterioration, the surface profile is not to exceed 1/4 -inch (peak to valley).
6. The substrate shall be sound and all spalls, voids and blow holes on vertical or horizontal surfaces must be repaired prior to placement of the primer coat.
 - a. Spalls shall be repaired in accordance with the requirements of the Architect and Membrane manufacturer.
7. Extent and location of thin surface patching shall require approval of the Architect and Waterproofing Manufacturer prior to the application of any system component.
8. For concrete materials with a compressive strength of less than 3,500 psi contact Waterproofing Manufacturer Technical Department for substrate preparation requirements.

D. Steel/Metal:

1. Clean and prepare metal surfaces to near white metal in accordance with SSPC - SP3 (power tool clean) or as required by membrane manufacturer. Extend preparation a minimum of 3 -inches beyond the termination of the membrane flashing materials. Notch steel surfaces to provide a rust-stop.
2. Stainless steel (series 400, 300) shall be abraded to provide a rough open surface.

E. Other Flashing Surfaces:

1. Remove all contaminants as required by membrane manufacturer. Surface preparation shall be performed by means approved by Owner or his designated Representative.

F. Finish Leveling, Patching and Crack Preparation:

1. General: Resin/sand mix is the preferred material for all substrate finish leveling, crack and wall/deck preparation and patching. Resin/sand patching mix provides a fast-set time of approximately 30 minutes and does not require surface grinding.
2. Primer/sand mix is an alternative substrate leveling and patching material over horizontal surfaces. Primer/sand patching mix provides a set time of approximately 30 minutes, and does not require surface grinding. Primer/sand mix is typically applied in conjunction with general surface priming.

3. Substrate Leveling & Patching: Substrate conditions are to be evaluated by the Contractor, the Owner, or his designated Representative, and Membrane manufacturer. Perform leveling and patching operations as follows:
 - a. Level uneven horizontal and low-slope surfaces with a leveling mixture of (PMMA) polymethyl methacrylate Alsan RS 233 Self-Leveling Mortar depth less than 1/2 - inch, (12mm) resin.
 - 1) Depths less than 1/2 -inch should be build up in separate layers.
 - a) Spread and plane this resin with a squeegee, trowel and/or roller to achieve a flat surface.
 - b) Spike roller may be used to smooth out the surfaces.
 - b. Fill cavities on horizontal and low-slope surfaces with a patching mixture of (PMMA) polymethyl methacrylate primer and approved kiln-dried sand in a 1:3 primer to sand ratio by volume or with (PMMA) polymethyl methacrylate Alsan RS Paste using trowels to apply the resin mortar in place and achieve flat surface.
 - c. Fill cavities on sloped and vertical surfaces with (PMMA) polymethyl methacrylate Alsan RS Paste using trowels to apply the resin mortar in place and achieve flat surface.
 - d. Silica sand must be kept absolutely dry during storage and handling.
 - e. Any surface to be leveled or filled must first be primed with an appropriate (PMMA) polymethyl methacrylate primer and all Alsan RS resin mortars shall be placed in lifts no greater than the maximum thickness indicated by the manufacturer.
4. Joint and Crack Preparation: Joints, cracks and fractures in the structural deck/substrate shall be prepared as defined below prior to installation of the waterproofing membrane. Note: Joints, cracks, and fractures may telegraph through the waterproofing membrane.
 - a. Non-Moving Cracks: Determine that crack is non-moving. Clean out crack by brushing and oil-free compressed air.
 - 1) Fill crack with (PMMA) polymethyl methacrylate Alsan RS Paste.
 - 2) Allow for a minimum of one (1) hour cure or as required by product manufacturer.
 - b. Moving Cracks: Determine that crack is moving. Clean out crack by brushing and oil-free compressed air.
 - 1) Fill crack with (PMMA) polymethyl methacrylate Alsan RS Paste.
 - 2) Allow for a minimum of one (1) hour cure or as required by product manufacturer.
 - 3) Apply resin and 4 -inch (10 cm) wide strip of membrane (resin and fleece) in strict accordance with Membrane manufacturer's written instructions.

3.3 PRIMER APPLICATION

- A. General:
 1. Mix and apply two-component primer in strict accordance with written instructions of Membrane Manufacturer.
 2. Use only proprietary materials, as supplied by the membrane manufacturer.
 3. The substrate surface must be dry, with any remaining dust or loose particles removed using clean, dry, oil-free compressed air, industrial vacuum, cloth wipe or a combination of methods.

4. Do not install primer on any substrate containing newly applied and/or active asphalt, coal-tar pitch, creosote or penta-based materials unless approved in writing by Membrane Manufacturer.
5. Some substrates may require additional preparation before applying primer.

B. Mixing of Polymethyl Methacrylate Primer:

1. Premix polymethyl methacrylate primer thoroughly with a spiral agitator or stir stick.
 - a. Add pre-measured catalyst amount into mixed primer container and mix the components for approximately 2 minutes with a clean spiral agitator on slow speed or stir stick without creating any bubbles or streaks.
 - 1) Do not aerate, the primer solution should be a uniform color, with no light or dark streaks present.
2. Do not thin primer. Determine required primer coverage for each substrate material/condition and apply in strict accordance with written instructions of Membrane Manufacturer.
3. Mix only that amount of primer that can be used within 15 minutes.

C. Mixing of Two-Component Epoxy Primer:

1. Mix A and B components together with a spiral agitator or stir stick.
 - a. Use slow speed.
 - b. Do not aerate, the primer solution should be a uniform color, with no light or dark streaks present.
2. Do not thin primer.
 - a. Determine required primer coverage for each substrate material / condition and apply in strict accordance with written instructions of Membrane Manufacturer.
3. Mix only that amount of primer that can be used within 15 minutes.

D. Application of Primer:

1. Apply primer in accordance with manufacturer's written instructions and details.
2. Roll or brush the primer evenly onto the surface to fully saturate the substrate in one application.
 - a. Monitor application rate and adjust depending on substrate absorbency.
 - b. Do not allow primer to pond or collect in low areas.
3. Apply primer only up to the edge of the membrane flashing terminations.
 - a. Primer application past the membrane terminations requires surfacing with an approved material.
4. For polymethyl methacrylate primer applications over cementitious substrates where protection from substrate wetness is required, apply primer coat at a heavier application rate until pore saturation is achieved.
5. For epoxy based primer applications, apply kiln-dried sand into the final coat of primer while still wet at the rate of 30 lbs. per 100 square -feet (1.5 kg/m²).
 - a. Use quartz size # 0 (0.4 – 0.8 mm).
6. Allow polymethyl methacrylate primers to cure for a minimum of thirty (30) minutes before membrane application.
 - a. Allow epoxy-based quick-dry primers to cure for a minimum of two (2) hours before membrane application.
 - b. Membrane must be applied to primer only when completely dry and without tack.

7. Premature exposure to moisture may require removal and application of new primer.
 - a. Do not apply new primer over exposed primer older than six (6) months, primer prematurely exposed to moisture, or primer used as temporary waterproofing, unless approved in writing by the Membrane Manufacturer.
- E. Disposal of Primer:
 1. Cured primer may be disposed of in standard landfills.
 - a. This is accomplished by thoroughly mixing all components.
 2. Uncured primer is considered a hazardous material and must be handled as such, in accordance with local, state and federal regulation.
 - a. Do not through uncured resin away.

3.4 MEMBRANE APPLICATION

- A. General:
 1. Mix and apply cold fluid-applied reinforced polymethyl methacrylate waterproofing membrane in strict accordance with written instructions of Membrane Manufacturer.
 - a. Use only proprietary membrane resins and materials, as supplied by the membrane manufacturer.
 2. The primed substrate surface shall be dry, with any remaining dust or loose particles removed using clean, dry, oil-free compressed air, industrial vacuum, cloth-wipe or a combination.
 3. Protect all areas where membrane has been installed.
 - a. Do not work off installed membrane during application of remaining work before three (3) hours of curing.
 - b. Movement of materials and equipment across installed membrane is not acceptable.
 - c. If movement is necessary, provide complete protection of affected areas.
 4. Closely follow the Membrane Manufacturer's recommendation for hot and cold weather application. Monitor surface and ambient temperatures, including the effects of wind chill.
- B. Mixing of Resin:
 1. Mix resin with a spiral agitator for a minimum of two (2) minutes until the liquid has a uniform color.
 2. Add the pre-measured Catalyst Powder to resin and mix with the same agitator for two (2) minutes or until the powder is completely mixed.
 - a. The catalyst is completely dissolved when there are no white specs remaining.
- C. Application of Resin/Fleece
 1. Apply mixed resin to the prepared surface in accordance with manufacturer's written instructions and details.
 - a. The resin should be rolled or brushed liberally and evenly onto the surface using a broad, even stroke. Cover one working area at a time, between 15 – 20 square feet (1.4 – 1.9 square meters).
 2. Roll out dry polyester fleece onto the liquid resin mix, making sure the SMOOTH SIDE IS FACING UP (natural unrolling procedure), avoiding any folds and wrinkles.
 - a. The fleece will begin to rapidly saturate with the liquid resin mix.

- b. Use a medium nap roller or brush to work the resin into the fleece, saturating from the bottom up, and eliminating air bubbles, wrinkles, etc.
 - c. The appearance of the saturated fleece should be light opaque amber with no white spots. White spots are indications of unsaturated fleece or lack of adhesion.
 - 1) Correct these faults before the resin cures.
 - 3. Apply additional liquid resin mix on top of fleece in accordance with manufacturer's written instructions and details to finish the saturation of the fleece.
 - a. Roll this final coating into the fleece, which will result in a glossy appearance.
 - b. The fleece can only hold so much resin and all excess should be rolled forward to the unsaturated fleece, eliminating ponding or excessive build-up of the resin.
 - c. Any excess resin left on the top of the fleece will weather and peel off.
 - d. The correct amount of resin will leave no whiteness in fleece and there will be a slightly fibrous surface texture.
 - e. The final resin coating should be smooth and uniform.
 - 4. Prevent contact between mixed/unmixed resin and new/existing membrane.
 - a. If any unmixed resin contacts membrane surface remove immediately and clean thoroughly with a cloth rag.
 - 5. At all fleece seams, allow a 2 -inch (5 cm) overlap for all side joints and a 4 -inch (10 cm) overlap for all end joints.
 - 6. At membrane tie-offs, clean in-place membrane with Alsan RS Cleaner once resin has cured.
 - a. Allow cleaner to fully evaporate before application of new resin.
- D. Disposal of Resin:
- 1. Cured resin may be disposed of in standard landfills. This is accomplished by thoroughly mixing all components.
 - 2. Uncured resin is considered a hazardous material and must be handled as such, in accordance with local, state and federal regulation.
 - a. Do not throw uncured resin away.

3.5 FLASHING APPLICATION

- A. General:
- 1. Install flashing system in accordance with the requirements and recommendations of the Membrane manufacturer and as depicted on standard drawings and details.
 - a. Provide system with base flashing, edge flashing, penetration flashing, counter flashing, and all other flashings required for a complete watertight system.
 - 2. Install the flashings before installing the surfacing/wearing layer.
 - 3. All membrane flashings shall be installed concurrently with the waterproofing surfacing/wearing layer as the job progresses.
 - a. Temporary flashings are not allowed without prior written approval from the Membrane manufacturer.
 - b. Should any water penetrate the new waterproofing membrane because of incomplete flashings, the affected area shall be removed and replaced at the contractor's expense.
 - 4. Provide a minimum vertical height of 4 -inch for all flashing terminations.

- a. Flashing height shall be at least as high as the potential water level that could be reached as a result of a deluging rain and/or poor slope.
 - b. Do not flash over existing through-wall flashings, weep holes and overflow scuppers.
 - c. All flashings shall be terminated as required by the Membrane Manufacturer.
 5. The primed substrate surface shall be dry, with any remaining dust or loose particles removed using clean, dry, oil-free compressed air, industrial vacuum, cloth-wipe or a combination.
 6. Protect all areas where membrane has been installed.
 - a. Do not work off installed membrane and/or surfacing/wearing layer during application of remaining work before three (2) hours of curing.
 - b. Movement of materials and equipment across installed system is not acceptable.
 - c. If movement is necessary, provide complete protection of affected areas.
 7. Closely follow the Membrane manufacturer's recommendation for hot and cold weather application. Monitor surface and ambient temperatures, including the effects of wind chill.
- B. Mixing of Resin:
1. Mix resin with a spiral agitator for a minimum of 2 minutes until the liquid has a uniform color.
 2. Add the pre-measured Catalyst Powder to resin and mix with the same agitator for 2 minutes or until the powder is completely mixed.
 - a. The catalyst is completely dissolved when there are no white specs remaining.
- C. Application of Resin/Fleece
1. Apply mixed resin to the prepared surface in accordance with manufacturer's written instructions and details. The resin should be rolled or brushed liberally and evenly onto the surface using a broad, even stroke. Cover one working area at a time.
 2. Roll out dry polyester fleece onto the liquid resin mix, making sure the smooth side is facing up (natural unrolling procedure), avoiding any folds and wrinkles.
 - a. The fleece will begin to rapidly saturate with the liquid resin mix.
 - b. Use a small nap roller or brush to work the resin into the fleece, saturating from the bottom up, and eliminating air bubbles, wrinkles, etc.
 - c. The appearance of the saturated fleece should be light opaque amber with no white spots.
 - 1) White spots are indications of unsaturated fleece or lack of adhesion. It is important to correct these faults before the resin cures.
 3. Apply additional liquid resin mix on top of fleece in accordance with manufacturer's written instructions and details to finish the saturation of the fleece.
 - a. Roll this final coating into the fleece, which will result in a glossy appearance.
 - b. The fleece can only hold so much resin and all excess should be rolled forward to the unsaturated fleece, eliminating excessive build-up of the resin.
 - c. Any excess resin left on the top of the fleece will weather and peel off.
 - d. The correct amount of resin will leave no whiteness in fleece and there will be a slightly fibrous surface texture.
 - e. The final resin coating should be smooth and uniform.
 4. Prevent contact between mixed/unmixed resin and new/existing membrane.

- a. If any unmixed resin contacts membrane surface remove immediately and clean thoroughly with a cloth rag.
 5. At all fleece seams, allow a 2 -inch (5 cm) overlap for all side joints and a 4 -inch (10 cm) overlap for all corner joints.
 6. At membrane tie-offs, clean in-place membrane with Alsan RS Cleaner once resin has cured. Allow cleaner to fully evaporate before application of new resin.
- D. Disposal of Resin:
 1. Cured resin may be disposed of in standard landfills.
 - a. This is accomplished by thoroughly mixing all components.
 2. Uncured resin is considered a hazardous material and must be handled as such, in accordance with local, state and federal regulation.
 - a. Do not throw uncured resin away.
- E. Metal Flashing – General:
 1. Metal flashings shall be fabricated in accordance with the current recommendations of SMACNA and in accordance with standard drawings and project details.
 2. Metal flashing flanges to which membrane is to be bonded shall be a minimum of 4 - inches in width, and secured to the substrate 6 -inches on center staggered with fasteners appropriate to the substrate type.
 - a. The flanges shall be provided with a roughened surface that has been cleaned of all oil and other residue.
 3. Metal edges that will be overlaid with membrane shall be provided with a 1/4 -inch min. hemmed edge.
 4. Apply primer, resin and fleece to metal flange, extending membrane to outside face of metal edging, and to vertical face of metal base/curb flashing.
- F. Membrane Flashing – General:
 1. Membrane flashings shall be fabricated with primer appropriate for the substrate surface, flashing grade type resin of the same base chemical type as the field membrane, and fleece of the same weight as the field membrane unless specified otherwise.
 2. Primer, resin, and fleece mixing and application methods as specified for field membranes are also suitable for membrane flashing grade.
 3. Fleece shall overlap 2 -inch (5 cm) minimum for all joints. Fleece shall be cut neatly to fit all flashing conditions without a buildup of multiple fleece layers. Work wet membrane with a brush or roller to eliminate blisters, openings, or lifting at corners, junctions, and transitions.
- G. Pipes, Conduits, and Unusually Shaped Penetrations:
 1. Flash all penetrations using cold fluid-applied reinforced polymethyl methacrylate roof membrane. Flashing material shall be resin as specified by membrane manufacturer with appropriate fleece reinforcement.
 2. Flashing is typically constructed as a two-part assembly consisting of a vertical wrap and a horizontal target patch. There must be a minimum of a 2 -inch (5 cm) overlap between vertical and horizontal flashing components.
- H. Drains and Scuppers:
 1. Acceptable drain and scupper materials are cast iron, cast aluminum, and copper.
 2. Connect new drains and scuppers to existing storm sewer system.

3. Alternatively, replace all broken or damaged parts of existing drains and scuppers, or provide and install an acceptable insert.
 4. Flash drains and scuppers using cold fluid-applied reinforced polymethyl methacrylate roof membrane. Flashing material shall be the same resin used in the field membrane with fleece reinforcement.
 5. Flashing material shall extend 4 -inches minimum onto drain, scupper, or insert flange.
 6. Install clamping ring if provided as part of the drain or scupper design. Install a strainer basket to prevent debris from clogging the drainage line.
- I. Hot Stacks:
1. Protect the membrane components from direct contact with steam or heat sources when the in-service temperature exceeds 150 °F.
 - a. In all such cases flash to an intermediate "cool" sleeve.
 2. Fabricate "cool" sleeve in the form of a metal cone using galvanized metal in accordance with Membrane manufacturer's details.
 3. Flash all penetrations using cold fluid-applied reinforced polymethyl methacrylate roof membrane.
 - a. Flashing material shall be resin as specified by membrane manufacturer with appropriate fleece reinforcement.
 4. Flashing is typically constructed as a two-part assembly consisting of a vertical wrap and a horizontal target patch.
 - a. There must be a minimum of a 2 -inch (5 cm) overlap between vertical and horizontal flashing components.
- J. Flexible Penetrations:
1. Provide a weather-tight gooseneck of round cross-section for each penetration or group of penetrations.
 - a. Set in Water cut-off mastic and secure to the structural substrate.
 - 1) Acceptable gooseneck material is copper, of a sheet weight appropriate for the application.
 2. Flash all penetrations using cold fluid-applied reinforced polymethyl methacrylate roof membrane.
 - a. Flashing material shall be resin as specified by membrane manufacturer with appropriate fleece reinforcement.
 3. Flashing is typically constructed as a two-part assembly consisting of a vertical wrap and a horizontal target patch.
 - a. There must be a minimum of a 2 -inch (5 cm) overlap between vertical and horizontal flashing components.
- K. Walls, Curbs and Base Flashings:
1. Wall, curb and base flashings shall be installed to solid substrate surfaces only.
 - a. Adhering to gypsum-based panels, cementitious stucco, synthetic stucco, wood or metal siding and other similar materials are not acceptable.
 2. Flash all walls, curbs and base flashings using cold fluid-applied reinforced polymethyl methacrylate roof membrane.
 - a. Flashing material shall be resin as specified by membrane manufacturer with appropriate fleece reinforcement.

3. Reinforce all transition locations and other potential wear areas with a 4 -inch wide polyester fleece bottom layer evenly positioned over the transition prior to installing the exposed flashing layer.
4. Reinforce all inside and outside corners with a 4 -inch diameter conical piece of fleece prior to installing the exposed flashing layer.
5. All pins, dowels and other fixation elements shall be flashed separately with a vertical flashing component prior to installing the exposed flashing layer.
6. Extend flashing a minimum of 4 -inches onto the field substrate surface.

L. Electrical Conduit, Gas Lines and Lightning Protection

1. Supports for electrical conduit and gas lines greater than 1 -inch in diameter require the use of a separate engineered support system.
2. Supports for electrical conduit and gas lines 1 -inch or less in diameter, and bases for lightning protection rods and cable, can be adhered directly to the membrane surface with a single-component, high quality polyurethane sealant.

3.6 DRAINAGE MAT INSTALLATION

- A. General: Install drainage mat material in accordance with the requirements and recommendations of the Membrane manufacturer and as depicted on standard drawings and details.
- B. Loose-lay drainage mat over membrane system. Cut to fit around flashed penetrations of membrane.

3.7 PROTECTION PAD INSTALLATION

- A. General: Install protection pads in accordance with the requirements and recommendations of the Membrane manufacturer and as depicted on standard drawings and details.
- B. Extend protect pad material beyond podium pedestal base a minimum of 2 inches in all directions.
- C. Fully adhere protection pads to drainage mat with Membrane manufacturer's jointing mastic. No primer is required.

3.8 TEMPORARY CLOSURES & WATERSTOPS

- A. Contractor shall be responsible to ensure that moisture does not damage any completed section of the new waterproofing system.
 1. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
 2. All temporary closures shall be made as recommended or required by the membrane manufacturer.

3.9 PROTECTION

- A. Upon completion of waterproofing and flashings (including all associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period.
 - 1. Protect all areas where membrane has been installed.

3.10 CLOSEOUT

- A. Correction of Work:
 - 1. Work that does not conform to specified requirements including tolerances, slopes, and finishes shall be corrected and/or replaced. Any deficiencies of membrane application, termination and/or protection as noted during the Membrane manufacturer's inspections shall be corrected and/or replaced at Contractor's expense.

3.11 CLEAN-UP

- A. Site clean-up, including both interior and exterior building areas that have been affected by construction, shall be restored to preconstruction condition.

- END OF SECTION -

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WATERPROOFING CONTRACTOR CERTIFICATION

Project Name: _____

Building No./Address: _____

General Contractor: _____

Date of Installation: _____

Waterproofing Manufacturer: _____

WATERPROOFING CERTIFICATION:

As the Waterproofing Subcontractor on this project, I certify that the specified waterproofing system(s) have been installed in accordance with the manufacturer's published criteria, project specifications, and drawings.

Name of Subcontractor's Company: _____

Name of Principal in Subcontractor's Company: _____

Signature of Principal: _____ Date: _____

- SECTION 07 1900 -

WATER REPELLENT AND GRAFFITI RESISTANT COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and penetrating film forming water-repellent and graffiti resistant coatings which do not alter natural or fabricated surface appearances for the following vertical and horizontal materials:
 - 1. Architectural Precast Concrete specialties
 - 2. Adhered Thin Brick masonry
 - 3. Exterior Tiling
 - 4. Exterior Stone Cladding.

1.3 RELATED REQUIREMENTS

- A. Section 01 4339 "Mockup Requirements" for mockups.
- B. Section 01 4553 "Façade Mockup Testing" for mockup of exterior ground level concrete wall treatment.
- C. Section 04 2115 "Adhered (Thin) Brick Veneer".
- D. Section 04 4200 "Exterior Stone Cladding".
- E. Section 07 2419 "Exterior Insulation and Finish System (EIFS)"
- F. Section 07 9213 "Exterior Facade Joint Sealants" to be installed and fully cured prior to installation of the material specified in this Section.
- G. Section 09 3053 "Exterior Tiling".
- H. Section 09 9113 "Exterior Painting" for concrete substrates to be painted.

- I. Section 09 9623 "Graffiti Resistant Coatings" for product to be applied to Exterior Insulation and Finish System (EIFS).

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Installed water repellents shall comply with performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard substrate assemblies based on Project-specific preconstruction testing of existing substrate assemblies by a qualified testing agency.
 1. Select sizes and configurations of assemblies to adequately demonstrate capability of water repellents to comply with performance requirements.
 2. In addition to verifying performance requirements, use test applications to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrate assemblies.
 3. Notify Architect (7) seven days in advance of the dates and times when assemblies will be tested.

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300 "Submittal Procedures".
- B. Product Data: For each type of product indicated.
 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- C. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- E. Samples for Verification: For each material to be applied, on representative samples of the actual substrate.
 1. Provide samples in addition to site mockups.
 2. Provide stepped Samples defining each separate coat. Resubmit until required sheen is achieved.
 3. List of material and application for each coat of each sample. Label each sample for location and application.
 4. Submit samples on the following substrates for Architect's review of shade and sheen:
 - a. Quantity: (4) four of each substrate
 - b. Size:
 - 1) Architectural Precast Concrete: 12 -inches (100-mm-) square.
 - 2) Thin Brick: Full size field bricks

- 3) Modular Brick: Full Size bricks
- 4) Stone Cladding: 12 -inches (100-mm) square.
- 5) Exterior Tile: Full size or 12 -inches (100-mm) square minimum.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience.
 - 1. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Product Certificates: For each type of water repellent, from manufacturer.
- C. Preconstruction Testing Reports: For Water-repellent and Graffiti-treated substrates.
- D. Field quality-control reports.
- E. Warranty: Special warranty specified in this Section. Submit copies of manufacturer's required documentation that installer submitted to manufacturer.

1.8 DEFINITIONS

- A. RILEM: International Union of Testing and Research Laboratories for Materials and Structures located in Paris, France. (Reunion Internationale des Laboratoires d'Essais et de Recherches sur les Matériaux et des Constructions.)
 - 1. Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.
- B. RILEM tube: Manufacturers committee, Commission 25-PEM developed a method to assess deterioration of natural building stone utilizing what has become known as a RILEM tube.
 - 1. These tubes are now commonly used to evaluate water absorption rates on many new, existing, man-made and naturally occurring building materials.

1.9 MOCKUPS

- A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each substrate required. Duplicate finish of approved sample Submittals.
 - 1. Contractor shall build a separate site mockup panel of each different substrate to represent surfaces and conditions for application.
 - a. Size: At least 4 -square feet or as directed by Architect, of wall surface for each different substrate.
 - b. A separate mockup shall be required Interior Thin Brick veneer.
 - 2. If approved by Architect, Architect shall select one area or building façade surface of each different substrate to represent surfaces and conditions for application.
 - a. Size: At least 4 -square feet or as directed by Architect, of wall surface for each different substrate.
 - 3. Apply coatings to each surface as specified.

- a. After finishes are accepted, Architect will use the surface to evaluate coating systems of a similar nature.
4. Final approval of coatings will form and establish benchmark samples.

1.10 PROJECT CONDITIONS

- A. Surface Preparation: Contractor or applicator shall be responsible for providing a clean, dry substrate free from oil, dirt, grease, efflorescence or any other coating which may inhibit penetration and adhesion of Water Repellent and/or Graffiti resistant coating. This requirement applies to new construction, renovation or remedial projects. Substrate must be completely dry prior to applying product.
- B. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
 1. Concrete surfaces and mortar have cured for not less than 28 days.
 2. Ambient temperature is above 40 deg F (4.4 deg C) and below 95 deg F and will remain so for 24 hours.
 3. Substrate is not frozen and substrate-surface temperature is above 40 deg F (4.4 deg C) and below 100 deg F (37.8 deg C).
 4. Rain is not predicted within 12 hours.
 5. Not less than 48 hours have passed since surfaces were last wet.
 - a. Surface must be completely dry.
 6. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.
 7. Building has been closed in for not less than 30 days before treating wall assemblies.
- C. Provide mechanical ventilation during and after application to dissipate fumes if natural ventilation is insufficient.

1.11 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed graffiti resistant coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
 1. Installer to obtain preapproval of installation material and procedures. Submit manufacturer's required documentation prior to commencement of construction,
- B. VOC Classification: Provide coating materials that have a VOC classification meeting requirements specified in Section 01 6116.

1.12 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
 1. Name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.

WATER REPELLENT AND GRAFFITI RESISTANT COATINGS

4. Contents by volume, for vehicle constituents.
5. Application instructions.
6. Handling instructions and precautions.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a temperature range between 50 deg F and 85 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect materials from freezing.
2. Keep storage area neat and orderly.
3. Remove oily rags and waste daily.
4. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.13 WARRANTY

- A. Comply with provisions of Section 01 7700 "Closeout Procedures".
- B. Special Warranty: Manufacturer's standard form in which manufacturer, Applicator and contractor agree(s) to repair or replace materials that fail to maintain water repellency specified in "Performance Requirements" Article within specified warranty period.
 1. Warranty Period:
 - a. Water Repellent:
 - 1) Vertical Applications: Ten (10) years
 - 2) Horizontal Applications: Five (5) years
 - b. Graffiti Resistant Coating: Five (5) years
 2. Warranty shall include labor for reapplication of new materials by original applicator
 3. Warranty shall include all products necessary for reapplication by product manufacturer.

1.14 EXTRA MATERIAL

- A. Furnish extra materials from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 1. Coatings Quantity: 5 percent, but not less than 1 gal. (3.8 L) of each material applied.
 - a. Provide two copies of the mixing formula to the Architect in addition to the instructions attached to paint containers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers, coatings and primers. Comply with limits specified in Section 01 6116.
- B. VOC Classification: Provide Water Repellent and/or Graffiti resistant coating materials that have a VOC classification of 100 g/L or less and complies with SCAQMD Rule 1113.

WATER REPELLENT AND GRAFFITI RESISTANT COATINGS

1. Refer also to Section 01 6116 Volatile Organic Compound (VOC) Restrictions.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01 3100 "Project Management and Coordination."
- D. General Performance: Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.
 1. Water Repellents: Comply with performance requirements specified, as determined by preconstruction testing on— substrate assemblies representing those indicated for this Project.
 2. Graffiti Resistant Coating: Comply with performance requirements specified, as determined by preconstruction testing on substrate assemblies representing those indicated for this Project.
- E. Water Absorption: Minimum 90 percent reduction of water absorption after 24 hours in comparison of treated and untreated specimens.
 1. Precast Concrete: ASTM C 642.
 2. Clay Brick: ASTM C 67.
- F. Water-Vapor Transmission:
 1. Maximum 15 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, according to ASTM E 96/E 96M.
- G. Water Penetration and Leakage through Substrate: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, according to ASTM E 514.
 1. Manufacturers authorized representative shall conduct the RILEM tube test to determine that water absorption falls within allowable levels.
 - a. Typically, after 20 minute test, the water level should be no lower than the 1.0 mL graduation
 - b. CMU, after 20 minute test, the original water level of 2.5 mL shall read no less than 3.0 mL.
- H. Durability: Maximum 5 percent loss of water-repellent properties after 2500 hours of weathering according to ASTM G 154 in comparison to water-repellent-treated specimens before weathering.
- I. Chloride-Ion Intrusion in Concrete: AASHTO T-259
 1. Untreated concrete has 15 times the Chloride Ion content than treated concrete.

2.2 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products indicated in other Part 2 articles.

2.3 COATINGS MATERIALS, GENERAL

- A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

WATER REPELLENT AND GRAFFITI RESISTANT COATINGS

- B. Material Quality: Provide manufacturer's highest grade of the various coatings specified. Materials not displaying manufacturer's product identification are not acceptable.
1. Proprietary Names: Use of manufacturer's proprietary product names to designate materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

2.4 PENETRATING WATER REPELLENT & GRAFFITI RESISTANT COATING SYSTEM

- A. Silicone-Resin Clear Liquid Sealer, Penetrating Water Repellent Water Sealant & Anti-Graffiti: Clear, breathable, inorganic RTV Silicone Rubber water repellent for porous to dense substrates; with a waterborne solution containing not less than 3 and up to 15 percent solids by weight; and with 100 g/L or less of VOCs.
1. Basis of Design: Following products for the following applications:
 - a. Mfg: Professional Products of Kansas
 - b. Application:
 - 1) Water Repellent: PWS-8 Extra
 - 2) Graffiti Resistant coating:
 - a) First Coat: PWS-15 Super
 - b) Second Coat, Typical, uno: PWS-8 Extra
 2. Acceptable alternate mfg: Subject to compliance with requirements, provide the following:
 - a. ChemPro, Dura Pel GS
- B. The coating product listed above is selected as a standard of quality and based on manufacturers recommendations for execution. Application procedure and coverage rates must be in conformance with effectiveness of testing samples submitted, recommendation of application rates suggested, approved manufacturers standards and as a minimum, that specified herein. ,
1. Proposed alternate products must be equal in terms of chemical composition and performance standards.
 - a. Products must be penetrating permanent treatments using a silicone rubber base and not contain any paraffin waxes, urethanes or polysiloxanes.
 - b. Silane and siloxane based products will not be considered because of their lack of elongation (400 percent), allowing for thermal expansion and contraction.
 - c. Products must be non-sacrificial, allowing for repeated cycles of tagging and cleaning without the requirement of reapplication of the sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements.
 - a. Check moisture content in three representative locations by method recommended by manufacturer.
 - 2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
 - 3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 - 4. Verify that required repairs are complete, cured, and dry before applying water repellent.
 - 5. Verify that joint sealant work in adjoining surfaces is complete. Delay application until sealants have cured.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General:
 - 1. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - a. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
 - 2. Remove loose particles, foreign matter, and oil by method which will not affect coating application.
- B. Cleaning: Before applying coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Prepare surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, release agents, silicone and polymer coatings.
 - a. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces if recommended by coating manufacturer and approved by Architect during Mockup process.
 - b. Roughen as required to remove glaze if recommended by coating manufacturer and approved by Architect during Mockup process.
 - 1) Do not proceed on EIFS unless approved in writing by EIFS finish manufacturer and Architect.

- c. Use abrasive blast-cleaning methods if recommended by coating manufacturer and approved by Architect during Mockup process.
 - 1) Do not proceed on EIFS unless approved in writing by EIFS finish manufacturer and Architect.
 - d. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- 2. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- D. Material Preparation: Carefully prepare coating materials according to manufacturer's written instructions.
 - 1. Maintain containers and applying coatings in a clean condition, free of foreign materials and residue.
- E. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of coating system components. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of components being deposited on surfaces. Cover live plants and grass.
- F. Coordination with Sealants: Do not apply coatings until sealants for joints adjacent to surfaces receiving coatings have been installed and cured.
 - 1. Water Repellent and Graffiti resistant coating work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, Water Repellent and/or Graffiti resistant coatings, and sealant materials identical to those used in the work.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of Water Repellent and/or Graffiti resistant coatings and to instruct Applicator on the product and application method to be used.
- B. General: Apply coatings according to manufacturer's written instructions.
 - 1. Coating type:
 - a. Water repellent: Single coat application
 - b. Graffiti resistant: Two coats for Graffiti resistant applications
 - 2. Use applicators and techniques best suited for the material being applied.
 - 3. Do not apply coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
 - 4. Coating surface treatments and finishes are indicated in the coating system descriptions.
 - 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces.

- C. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. Apply coating using low pressure airless sprayer in number of coats and at rate indicated by manufacturer to obtain penetration and full coverage.
 - 2. The number of coats and film thickness required is the same regardless of application method.
 - a. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - b. Allow sufficient time between successive coats to permit proper drying.
 - 3. Give special attention to edges, corners, crevices, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
- D. Application Procedures: Apply coatings according to manufacturer's written instructions.
 - 1. Spray Equipment: Use mechanical methods to apply coating as permitted by manufacturer's written instructions and governing regulations.
 - 2. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
- E. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate.
 - 1. Manufacturers authorized representative shall provide RILEM Tube Evaluation Testing of installed product after application to determine that installed product meets minimum Water-Repellency values
- F. Completed Work: Match approved Samples for shade and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 FIELD QUALITY CONTROL

- A. After coatings have dried, spray surfaces with clear water to reveal areas that have not received application.
 - 1. Allow surfaces to dry before applying water repellent materials in areas exhibiting moisture absorption.

3.5 CLEANING

- A. Immediately clean coatings off of adjoining surfaces and surfaces soiled or damaged by application as work progresses. Repair damage caused by application.
 - 1. Comply with manufacturer's written cleaning instructions.

3.6 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
 - 1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.

WATER REPELLENT AND GRAFFITI RESISTANT COATINGS

2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.7 SCHEDULE

- A. Apply at all exterior exposed surfaces specified and indicated on Drawings:
 1. Adhered Architectural Precast Concrete.
 2. Adhered Thin Brick Veneer.
 3. Adhered Stone cladding.
 4. Exterior Tile as approved by Architect.
- B. Provide the following coating system over the following vertical surfaces; and where otherwise indicated:
 1. Entire Building: One coat for water repellency.
 - a. Do not apply to EIFS, refer to Section 09 9623 "Graffiti Resistant Coatings"
 2. Lower Building: Two coats, for non sacrificial anti-graffiti protection.
 - a. From grade to the transition to dissimilar material at third level of building.

- END OF SECTION -

- SECTION 07 2100 -**THERMAL INSULATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Fiberglass thermal insulation, urea-formaldehyde-free and made with non-toxic acrylic thermosetting resin, in addition to the following:
 - 1. Insulation:
 - a. Glass Fiber Blanket Insulation.
 - 1) Concealed building envelope batt insulation.
 - 2) Exposed building insulation.
 - b. Mineral Wool Blanket Insulation.
 - c. Fire Safing insulation.
 - d. Cavity wall insulation.
 - 2. Accessories:
 - a. Vapor and air barrier membranes.
 - b. Anchor pin components and wire supports.
- B. Rigid Foam Plastic Board thermal insulation, urea-formaldehyde-free for exterior building envelope conditions and/or conditions specifically indicated including interior conditions:
 - 1. Conditions: Including, but not limited to;
 - a. Behind spandrel glazing.
 - b. Behind metal wall panels.
 - c. Exposed building insulation where indicated.
 - d. Concealed insulation.
 - e. Below grade between Shoring and waterproofing assembly.
 - 1) Refer also to Section 07 1326.
 - f. Below grade between Earth and waterproofing assembly. (Protection board)
 - 1) Refer also to Section 07 1326.
 - g. Sandwiched between structural roof deck and raised concrete slab (Over-framed conditions).
 - 1) Refer to Drawings.

- h. Structural Foam 'shim' sandwiched between Shoring and below grade foundation walls.
 - 1) Refer to Drawings.
- 2. Types:
 - a. Extruded Foam-plastic board insulation.
 - b. Expanding foam insulation.
 - c. Expanded polystyrene where specifically indicated.
- C. Polyurethane Spray Foam thermal insulation, urea formaldehyde-free spray foam, primer for concrete tested to require primer and Intumescent thermal barrier topcoat for application to concrete and conditions specifically indicated:
 - 1. Conditions: Including, but not limited to:
 - a. Underside of concrete floor decks/slabs at parking garage floor levels.
 - b. Coordinate with hanger wire for suspended ceilings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 01 9113 "General Commissioning Requirements".
- D. Section 03 3816 "Unbonded Post Tensioned Concrete"
- E. Section 07 2419 "Exterior Insulation and Finish System (EIFS)"
- F. Section 07 1326 "Self-Adhered Sheet Waterproofing"
- G. Section 07 8413 "Penetration Firestopping" for sealing penetrations through fire rated assemblies.
- H. Section 07 8446 "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
- I. Section 09 0512 "Concrete Floor Moisture Content & pH Testing" for concrete that exceeds 12 percent testing of concrete to be finished with spray applied foam.
- J. Section 09 8100 "Acoustical Insulation" for sound attenuation blankets within interior partitions and acoustic insulation panels.
- K. Division 22 Section "Plumbing Insulation".
- L. Division 23 Section "HVAC Insulation".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

- B. International Mechanical Code with City of Phoenix administrative provisions and amendments.
- C. ASTM C165 - Test Method for Measuring Compressive Properties of Thermal Insulations.
- D. ASTM C411 - Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2007.
- F. ASTM C764 - Specification for Mineral Fiber Loose-Fill Thermal Insulation.
- G. ASTM C1104 - Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- H. ASTM C1304 - Standard Test Method for Assessing the Odor Emission of Thermal Insulation Materials.
- I. ASTM C1320 - Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation.
- J. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.
- L. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.
- M. ASTM E119, - Test Methods for Fire Tests of Building Construction and Materials.
- N. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..
- O. Manufacturer's recommendations and specifications.

1.5 DEFINITIONS

- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES .
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.8 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.

1.9 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources.
 - 1. Store inside and in a dry location.
 - 2. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- C. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

THERMAL INSULATION

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
 - 1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.
 - 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosum on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

2.2 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.3 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, 1.60 lb/cu. ft. (26 kg/cu. m), Type V, 100 psi (690 kPa) unless otherwise indicated. with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
 - 1. MATERIALS Basis-of-Design Product: The design is based on **Styrofoam Square Edge**, manufactured by **Dow Chemical Company**, 200 Larkin Court, Midland, MI, 48674, 866-583-2585; www.dowbuildingmaterials.com.
 - 2. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufacturers:
 - a. DiversiFoam Products.
 - b. Owens Corning.
 - c. Pactiv Building Products Division.
 - 3. Type and compressive strength:
 - a. Type V, 100 psi (690 kPa) and 1.60 lb./cu. Ft. typical unless indicated otherwise in Drawings.
 - b. Type VI, 40 psi (276 kPa).
 - 1) Refer to Structural Drawings and 232/S3.2 for applications using foam infill
 - 4. Edge treatment:

- a. Square Edge/Shiplap
 - b. Manufacturers approved foil tape in color to match facing.
5. Application:
 - a. Refer to drawings and details
 - b. Sandwich insulation fill between structural concrete and topping slab (Over-framed conditions).
- B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type VII, **2.20 lb/cu. ft. (35 kg/cu. m).**, **60 psi** with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
 1. MATERIALS Basis-of-Design Product: The design is based on **Styrofoam Highload 60**, manufactured by **Dow Chemical Company**, 200 Larkin Crt., Midland, MI, 48674. Phone: 866-583-2585; www.dowbuildingmaterials.com.
 2. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufacturers:
 - a. DiversiFoam Products.
 - b. Owens Corning.
 - c. Pactiv Building Products Division.
 3. Edge treatment:
 - a. Square Edge/Shiplap
 - b. Manufacturers approved foil tape in color to match facing.
 4. Application:
 - a. Protection board placed over Earth and covered with waterproof sheet membrane.
 - b. Structural Foam 'shim' sandwiched between Shoring and below grade foundation walls.
- C. Foil-Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to **4 -inches (101 mm)**.
 1. MATERIALS Basis-of-Design Product: The design is based on **Thermax Light Duty Insulation**, manufactured by **Dow Chemical Company**, 200 Larkin Crt., Midland, MI, 48674. Phone: 866-583-2585; www.dowbuildingmaterials.com.
 2. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
 - a. Atlas Roofing Corporation.
 - b. Rmax, Inc.

2.4 GLASS FIBER BLANKET INSULATION

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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1. CertainTeed Corporation.
2. Dow Chemical
3. Guardian Building Products, Inc.
4. Johns Manville.
5. Knauf Insulation.
6. Owens Corning.

C. Formaldehyde-Free Unfaced Glass-Fiber Batt Insulation: **JM Formaldehyde-Free Unfaced Batts**; ASTM C665, Type I (blankets without membrane facing); with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:

1. Combustion Characteristics: Passes ASTM E136.
2. Critical Radiant Flux: ASTM E970, greater than 0.11 Btu/sq ft s (0.12 W/cm sq).
3. Water Vapor Sorption: ASTM C1104, 5 percent or less.
4. Odor Emission: Passes ASTM C1304.
5. Corrosiveness: Passes ASTM C665.
6. Fungi Resistance: Passes ASTM C1338.
7. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
 - a. 3-1/2 -inches (89 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
 - b. 3-5/8 -inches (92 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
 - c. 5-1/2 -inches (140 mm) thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F (3.7 K x sq. m/W at 24 deg C).
 - d. 6-1/2 -inches (165 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).

D. Formaldehyde-Free FSK-25 Faced Glass-Fiber Batt Insulation: **JM Formaldehyde-Free FSK-25 Faced Batts**; ASTM C665, Type III, Class A, Category 1 with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:

1. Combustion Characteristics: Passes ASTM E136.
2. Critical Radiant Flux: ASTM E970, greater than 0.11 Btu/sq ft s (0.12 W/cm sq).
3. Water Vapor Permeance: ASTM E96, 0.05 perms (3 ng/Pa-s m2).
4. Water Vapor Sorption: ASTM C1104, 5 percent or less.
5. Odor Emission: Passes ASTM C1304.
6. Corrosiveness: Passes ASTM C665, 13.8.
7. Fungi Resistance: Passes ASTM C1338.
8. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
 - a. 3-1/2 -inches (89 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
 - b. 3-5/8 -inches (92 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
 - c. 5-1/2 -inches (140 mm) thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F (3.7 K x sq. m/W at 24 deg C).

- d. 6-1/2 -inches (165 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).

2.5 GLASS-FIBER BOARD INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. CertainTeed Corporation.
 2. Johns Manville.
 3. Knauf Insulation.
 4. Owens Corning.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- C. Unfaced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics.
1. Nominal density of 2.25 lb/cu. ft. (36 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 2. Nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 3. Nominal density of 4.25 lb/cu. ft. (68 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 4. Nominal density of 6 lb/cu. ft. (96 kg/cu. m), thermal resistivity of 4.4 deg F x h x sq. ft./Btu x in. at 75 deg F (30.5 K x m/W at 24 deg C).
 5. Thickness: 2 -inches unless shown otherwise (R-8.7).
- D. Unfaced, Flexible Glass-Fiber Board Insulation: ASTM C 612, Type IA; ASTM C 553, Types I, II, and III; or ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics.
1. Nominal density of 1.0 lb/cu. ft. (16 kg/cu. m), thermal resistivity of 3.7 deg F x h x sq. ft./Btu x in. at 75 deg F (25.7 K x m/W at 24 deg C).
 2. Nominal density of not less than 1.5 lb/cu. ft. (24 kg/cu. m) or more than 1.7 lb/cu. ft. (27 kg/cu. m), thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
- E. Foil-Faced, Flexible Glass-Fiber Board Insulation: ASTM C 612, Type IA or ASTM C 553, Types I, II, and III; faced on one side with foil-scrim-kraft vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
1. Nominal density of 1.0 lb/cu. ft. (16 kg/cu. m), thermal resistivity of 3.7 deg F x h x sq. ft./Btu x in. at 75 deg F (25.7 K x m/W at 24 deg C).
 2. Nominal density of not less than 1.5 lb/cu. ft. (24 kg/cu. m) or more than 1.7 lb/cu. ft. (27 kg/cu. m), thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
- F. Foil-Faced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.

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1. Nominal density of 2.25 lb/cu. ft. (36 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 2. Nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 3. Nominal density of 4.25 lb/cu. ft. (68 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 4. Nominal density of 6 lb/cu. ft. (96 kg/cu. m), thermal resistivity of not less than 4.34 deg F x h x sq. ft./Btu x in. at 75 deg F (30.1 K x m/W at 24 deg C).
- G. Dark-Surfaced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; faced on one side with black glass-fiber mat or black polymer finish; maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
1. Nominal density of 1.5 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 4.2 deg F x h x sq. ft./Btu x in. at 75 deg F (29.1 K x m/W at 24 deg C).
 2. Nominal density of 2.25 lb/cu. ft. (36 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 3. Nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).
 4. Nominal density of 6 lb/cu. ft. (96 kg/cu. m), thermal resistivity of 4.5 deg F x h x sq. ft./Btu x in. at 75 deg F (31.2 K x m/W at 24 deg C).
- H. Sustainability Requirements: Provide glass-fiber board insulation as follows:
1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.6 MINERAL-WOOL BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
1. Fibrex Insulations Inc.
 2. Owens Corning.
 3. Roxul Inc.
 4. Thermafiber.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- C. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x Sq. Ft./Btu x in. at 75 deg F.
 2. Thickness: 2 -inches unless shown otherwise (R-8.7).

2.7 EXPANDING FOAM INSULATION

- A. Liquid type foam or light weight concrete with a minimum wet density of 2.0 pounds per cubic foot and a minimum R-value of 3.9 per 1 -inch thickness.
- B. Acceptable products are as follows:
 - 1. "Tripolymer" system as manufactured by C.P. Chemical Co., Inc. (914/428-2517).
 - 2. "Air Krete" as manufactured by Nordic Builders (480/892-0603).
 - 3. "Core-Fill 500" as manufactured by Tailored Chemical Products, Inc. (704/322-6512).
 - 4. "PolyMaster R-501" as manufactured by PolyMaster, Inc. (800/580-3626).

2.8 SAFING INSULATION AND ACCESSORIES

- A. Safing insulation shall be USG Thermafiber mineral fiber safing insulation, unfaced. Insulation shall comply with ASTM C665, Type I; ASTM C612, Classes 1 and 2; and have nominal 4.0 pcf density.
- B. Sealant shall be as approved by manufacturer of safing insulation for conditions shown.

2.9 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Two-Component Polyurethane Foam Insulation with primer and Intumescent 15 minute Thermal Barrier Topcoat:
 - 1. Basis of Design:
 - a. **STYROFOAM™** brand spray, model **MX2045** closed-cell spray polyurethane foam insulation as manufactured by **The Dow Chemical Company ("DOW")**, <http://building.dow.com/na/en/products/insulation/spfmx.htm> with approved;
 - b. **PERMAX HE58516 - Acryprime Substrate Primer** by **Henry**, www.henry.com, when concrete is field tested to be required and spray foam topcoated with;
 - c. **Intumescent 15 minute "Thermal Barrier" and "Ignition Barrier"** coating: by International Fireproof Technology, Model DC315, <http://www.insulationsupplies.com/products/dc-315>.
 - 2. Subject to compliance with requirements, provide alternate products by one of the following:
 - a. Spray Foam:
 - 1) BASF
 - 2) Refer to Section 01 2500 "Substitutions"
 - b. 15 minute "Thermal Barrier" and "Ignition Barrier" coating:
 - 1) Specialty Products, Inc., Flame Seal-TB
 - 3. Performance:
 - a. Surface Burning - Assembly: (After Thermal barrier coating)
 - 1) Flame Spread: 0
 - 2) Smoke Developed: 10
 - 3) 15 minute "Thermal Barrier" and "Ignition Barrier" coating:
 - a) 88.88 sq. ft./gal. at 18 mils wet and 12 mils dry) coverage rate of 1.136 gallons (4.3L) per 100 square feet (9.3 m²): UL 1715
 - 4) Standards:

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- a) UL1715: 15 minute Thermal Barrier of ICC-ES
 - b) NFPA 286
 - c) UL 723:
 - b. Primer: (Concrete surface)
 - 1) Color: Dark grey
 - 2) Percent solids: 50-55 percent by weight
 - 3) Application rate: 0.3 to 0.5 gallons / 100 square feet
 - 4) Elongation: 1600 psi.
 - 5) Permeability: 2.5 US Perms
 - c. Spray Foam:
 - 1) Core Density: 2.5 lb/cu. ft., min., ASTM D1622
 - 2) Compressive strength: 25 lb/in², ASTM D1621
 - 3) Tensile strength: 60 lb/in², ASTM D1623
 - 4) Closed Cell Content: > 95 percent, ASTM D6226
 - 5) Thermal Resistance: 6.4 deg F x h x sq. ft./Btu by 1 -inch. at 75 deg F (43 K x m/W at 24 deg C). ASTM C518
 - 6) Water Vapor Permeability: 2.2 perm -inch, ASTM E96
 - 7) Water Absorption: 2.5 percent by volume, ASTM D2842
 - 8) Surface Burning: Class A, ASTM E84
 - 9) Thickness / R-Value : (12 -inches maximum)
 - a) 3.5 -inches: R-Value 21
 - b) 4 -inches: R-Value 24
 - c) 5 -inches: R-Value 30
 - d) 6 -inches: R-Value 36
 - d. Intumescent 15 minute "Thermal Barrier" and "Ignition Barrier" coating:
 - 1) Finish: Flat
 - 2) Color: Off white
 - 3) Flash Point: None
 - 4) VOC: 47 g/l
 - 5) Type of cure: Coalescence
 - 6) Composition: Water base latex
 - 7) Application: Conventional or Airless spray
 - 8) Compliance: ICC-ES AC 377 Appendix X (Modified NFPA 286)
- 4. Additional standards and testing:
 - a. AC 377
 - b. ESR-2670, ICC-ES Evaluation Report
 - c. May be used in following building types:
 - 1) Type I
 - 2) Type II
 - 3) Type III
 - 4) Type IV
 - 5) Type V

5. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.10 AUXILIARY INSULATING MATERIALS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
 1. Products: Subject to compliance with requirements, provide one of the following :
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Gemco; Spindle Type.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 -inch (0.762 mm) thick by 2 - inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 -inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
 - a. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gemco; 90-Degree Insulation Hangers.
 2. Angle: Formed from 0.030-inch (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 -inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 -inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
 - a. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016 -inch (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 -inches (38 mm) square or in diameter.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; www.agmind.com RC round series or SC square series .
 - b. Gemco; www.gemcoinsulation.com Dome-Cap, R round series and/or S square series .
 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
 - d. Where indicated.
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 -inch (25 mm), 2 -inches (50 mm) or 3 -inches (76

mm) between face of insulation and substrate to which anchor is attached – refer to drawings and/or details for spacing required.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gemco; Clutch Clip, www.gemcoinsulation.com
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; TACTOO Adhesive. www.agmind.com
 - b. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
 - c. Gemco; Tuff Bond Hanger Adhesive, www.gemcoinsulation.com
- F. Wire and Insulation Supports: As manufactured by E-Z Wire Products or as recommended by insulation manufacturer.

2.11 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D 4397, 10 mils (0.25 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
- B. Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft. (12 kg/100 sq. m), with maximum permeance rating of 0.0507 perm (2.9 ng/Pa x s x sq. m).
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Raven Industries Inc.; DURA-SKRIM 6WW.
 - b. Reef Industries, Inc.; Griffolyn T-65.
- C. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or polyester scrim and weighing not less than 22 lb/1000 sq. ft. (10 kg/100 sq. m), with maximum permeance rating of 0.1317 perm (7.56 ng/Pa x s x sq. m) and with flame-spread and smoke-developed indexes of not more than 5 and 60, respectively, per ASTM E 84.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Raven Industries Inc.; DURA-SKRIM 2FR.
 - b. Reef Industries, Inc.; Griffolyn T-55 FR.
- D. Foil-Polyester-Film Vapor Retarders: Two layers of 0.5-mil (0.013-mm-) thick polyester film laminated to an inner layer of 1-mil- (0.025-mm-) thick aluminum foil, with maximum water-vapor transmission rate in flat condition of 0.0 g/h x sq. m and with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alumiseal Corporation; Zero Perm Vapor Barrier.

- E. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- F. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- G. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.
- H. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory.
 - 1. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated.
 - 1. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B. Extend insulation full thickness as indicated to envelop entire area to be insulated.
 - 1. Cut and fit tightly around obstructions, and fill voids with insulation.
 - 2. Remove projections that interfere with placement.
- C. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths.
 - 1. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's written recommendations.
 - 1. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
 - 2. Place insulation at exterior wall construction, and where shown on Drawings in manner to insure continuous thermal barrier.
- B. Install unfaced batts in wall framing at all exterior wall cavities.
 - 1. Friction fit.
 - 2. Install batts above termination of gypsum wallboard utilizing 18 gauge wire perpendicular to the batt at 18 -inches on center, or attach pin anchor at intervals required by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 -inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs
 - 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction / warm side not less than 0.75 -inch air space in front of foil unless shown otherwise..
 - 1) Insulation in attic at plenum spaces, which are exposed to view, shall be Type III foil-scrim-Kraft faced.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- E. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- F. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions.
 - 1. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.

2. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.5 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
 1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 -inches (406 mm) o.c.
 2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
 3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.6 INSTALLATION OF INSULATION IN/ON CEILINGS FOR SOUND ATTENUATION

- A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated.
 1. Extend insulation 48 -inches (1219 mm) up either side of partitions.
 2. R-19 minimum.

3.7 INSTALLATION OF CURTAIN-WALL INSULATION

- A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
 1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
 2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.8 INSTALLATION OF SAFING INSULATION

- A. Install safing insulation to fill gap between top of partition and horizontal material above, or as otherwise shown on Drawings. Apply sealant to complete safing assembly, as shown in;
 - 1. Gypsum Association Fire Resistance Design Manual (20th Edition), Section II (Requirements for Fire Protection).

3.9 INSTALLATION OF FOAM INSULATION - GENERAL

- A. Install in accordance with manufacturer's printed instructions to assure complete filling of cores. Fill penetrations through concrete foundation and exterior concrete walls.

3.10 INSTALLATION OF RIGID INSULATION FOR CONCRETE SUBSTRATES

- A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

3.11 INSTALLATION OF CLOSED CELL SPRAY FOAM INSULATION ASSEMBLY FOR CONCRETE SUBSTRATES

- A. Concrete substrate: Clean and prepare according to manufacturer's written instructions, as specified and listed as follows.
 - 1. ICC Evaluation Service, ICC-ES Evaluation Report: ESR-2670:
 - 2. Do not apply primer until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items are masked.
 - 3. Protect floor and wall surfaces from overspray.
- B. Moisture level of concrete substrate Testing:
 - 1. Establish an area at least 24 –inches by 48 –inches that has been cleaned and is free of dirt, dust and loose material.
 - 2. Moisture test concrete to determine moisture content.

- a. Level shall be 12 percent or less, otherwise concrete shall be treated to bring the moisture level to 12 percent maximum.
- C. Adhesion Testing:
1. Establish an area at least 24 -inches by 48 -inches that has been cleaned and is free of dirt, dust and loose material.
 2. Spray a light coat (1 -inch) thick with the foam insulation and let cure for 60 minutes within allowable application temperature range.
 3. Test adhesion after 60 minutes by trying to pull foam from surface.
 - a. Foam should be difficult to pull off and when it finally pulls off it should leave a foam residue visible.
 4. If adhesion does not meet this criteria, then the primer specified shall be applied to entire concrete surface designated to receive sprayed foam insulation in accordance with manufacturers written recommendations.
- D. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions, as specified and listed as follows.
1. ICC Evaluation Service, ICC-ES Evaluation Report: ESR-2670:
 2. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
 3. Applied to cleaned and prepared concrete substrates.
 4. Apply in multiple layers to final thickness as required by manufacturer.
 - a. First layer shall be 1/2 -inch to 1 -inch thick and allowed to cure for 30 minutes.
 - b. Subsequent layers shall be at a maximum thickness of 2 -inches each.
 5. Protect floor and wall surfaces from overspray.
- E. 15 minute "Thermal Barrier" and "Ignition Barrier": Install coating over spray foam insulation by spray application in accordance with manufacturers written instructions and as specified.
1. AC 377, Appendix X (Modified NFPA 286)
 2. Applied to cleaned and prepared spray foam.
 3. Apply at rate required by manufacturer to meet 15 minute criteria.
 4. Protect floor and wall surfaces from overspray.

3.12 INSTALLATION OF EXPANDING FOAM INSULATION

- A. Install in accordance with manufacturer's printed instructions to assure complete filling of cores.
1. Fill penetrations through concrete foundation and exterior concrete walls.
 2. Fill penetrations through concrete ceiling/floor assembly.
- B. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions.
1. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
 2. Applied to cleaned and prepared concrete substrates.

3.13 INSTALLATION OF RADIANT BARRIERS

- A. Install interior radiation control coating system according to ASTM C 1321.
- B. Install sheet radiant barriers according to ASTM C 1158.

3.14 PROTECTION

- A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
 - 1. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.15 INSULATION SCHEDULE

- A. Thicker or higher R-Values as indicated on Drawings shall govern over these thicknesses.
- B. Unfaced glass fiber batt insulation at all exterior walls, (R-19) as detailed, minimum.
- C. Unfaced glass fiber batt insulation (R-19) between conditioned and non-conditioned interior spaces.
- D. Unfaced glass fiber batt insulation (R-19) in cavity walls.
- E. Expanding foam insulation at penetration through exterior concrete walls, coordinate with waterproofing.
- F. Spray foam insulation to underside of concrete floor slabs between conditioned and un-conditioned spaces and where indicated.
- G. Rigid foam plastic board insulation: Locations and thickness as indicated on Drawings, if not shown, provide R19 minimum.
- H. Exterior Polyisocyanurate Foam Board Continuous Insulation at all exterior walls, (R-13) minimum.
- I. Foil-faced Polyisocyanurate foam board insulation: Locations and thickness as indicated on Drawings, if not shown, provide R19 minimum.
- J. Interior walls and partitions, refer to Section 09 8100 "Acoustical Insulation"
- K. Mineral wool insulation where indicated.
- L. Fire Safing where indicated and at rated walls.
- M. Vapor & Air Barriers.

- END OF SECTION -

EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes;
 - 1. Exterior insulation and finish system (EIFS) applied over water-resistive coating over sheathing.
 - a. Water management provisions and flashing to facilitate drainage of water to the exterior of the wall assembly.
 - b. Anchorage, bracing and reinforcing
 - c. All accessories required for complete installation.
 - d. Field Testing.
 - 2. Exterior finish system (EIFS) finish without foam applied over cast-in-place concrete.
 - a. Field Testing.
 - 3. Custom foam shapes with exterior insulation and finish system (EIFS) applied over water-resistive coating over sheathing including, but not limited to;
 - a. Exterior window sills.
 - b. Lintels.
 - 4. The weather barrier specified in Section 07 2500 shall be installed in accordance with EIFS manufacturer's requirements behind EIFS and all other wall cladding assemblies.
- B. Delegated design, structural calculations for design of the EIFS assembly.
 - 1. Design coordination and installation of decorative elements attached to the EIFS face, including attachment for plant-on items and structural back-up in the framing.
- C. Delegated design, structural calculations for design of the EIFS assembly.
 - 1. Design coordination and installation of decorative elements attached to the EIFS face, including attachment for plant-on items and structural back-up in the framing.

1.3 RELATED REQUIRMENTS:

- A. Section 01 4339 "Mockup Requirements".
- B. Section 01 4553 "Facade Mockup Testing"
- C. Section 01 8316 "Exterior Enclosure Performance Requirements".
- D. Section 03 3000 "Cast-In-Place Concrete"
- E. Section 05 4000 "Cold-Formed Metal Framing" for wall framing.
- F. Section 06 1600 "Sheathing" for Interior and Exterior sheathing conditions.
- G. Section 07 6200 "Sheet Metal Flashing and Trim" for vertical and horizontal joint covers.
- H. Section 07 2500 "Fluid-Applied Membrane Air Barriers" for fluid-applied weather barrier.
- I. Section 07 9213 "Exterior Façade Sealants" for sealing joints in exterior EIFS with elastomeric joint sealants.
- J. Section 09 9623 "Graffiti Resistant Coatings" for coating to be applied to EIFS.
- K. Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools" for over sheathing at In door Pool Ceiling , Open Bar, Pool Equipment room, as indicated on Drawings and as scheduled.
- L. Pertinent sections specifying openings and penetrations in the EIFS assembly.
- M. Pertinent sections specifying exterior cladding assemblies abutting or adjacent to the EIFS assembly.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Society for Testing Materials (ASTM):
 - 1. ASTM B 117 (Federal Test Standard 141A Method 6061) Standard Practice for Operating Salt Spray (Fog) Apparatus
 - 2. ASTM C 150 Standard Specification for Portland Cement
 - 3. ASTM C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
 - 4. ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - 5. ASTM C 1396 (formerly C 79) Standard Specification for Gypsum Board
 - 6. ASTM D 968 (Federal Test Standard 141A Method 6191) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
 - 7. ASTM D 2247 (Federal Test Standard 141A Method 6201) Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

8. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
9. ASTM D 4060 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
10. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
11. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
12. ASTM E 119 Standard Method for Fire Tests of Building Construction and Materials
13. ASTM E 330 Test Method for Structural Performance of Exterior Windows, Doors and Curtain Walls by Uniform Static Air Pressure Difference
14. ASTM E 331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
15. ASTM E 2098 Test Method for Determining the Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to Sodium Hydroxide Solution
16. ASTM E 2134 Test Method for Evaluating the Tensile-Adhesion Performance of Exterior Insulation and Finish Systems (EIFS)
17. ASTM E 2430 Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for use in Exterior Insulation and Finish System (EIFS)
18. ASTM E 2485 (formerly EIMA Std. 101.01) Standard Test Method for Freeze-Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water-Resistive Barrier Coatings
19. ASTM E 2486 (formerly EIMA Std. 101.86) Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)
20. ASTM E2568 Standard Specification for PB Exterior Insulation and Finish Systems
21. ASTM G 155 (Federal Test Standard 141A Method 6151) Standard Practice for Operating-Xenon Arc Light Apparatus, for Exposure of Nonmetallic Materials

C. Manufacturer's standards and specifications:

1. Outsulation Plus MD System: (Water managed)
 - a. DS110, Dryvit, Outsulation Plus MD System Details
 - b. DS131, Dryvit Expanded Polystyrene Insulation Board Specification
 - c. DS152, Dryvit Cleaning and Recoating
 - d. DS153, Dryvit Expansion Joints and Sealants
 - e. DS156, Dryvit Substrates
 - f. DS159, Dryvit Water Vapor Transmission
 - g. DS160, Dryvit Wind Load Requirements
 - h. DS218, Dryvit Outsulation Plus MD Application Instructions
 - i. DS248, Dryvit , The Dryvit Compound Warranty Program
 - j. DS456, Rapidry DM™ 35-50 or DS457, Rapidry DM™ 50-75 Data Sheets
 - k. DS445, Outsulation Plus MD Product Data Sheet
 - l. DS494, Dryvit AquaFlash® System
 - m. DS498 DryvitCARE EIFS Repair Procedures

D. Mil Std E5272 Environmental Testing

E. Mil Std 810B Environmental Test Methods

- F. NFPA 268 Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
- G. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
- H. ANSI FM 4880 Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies; Plastic Interior Finish Materials; Plastic Exterior Building Panels; Wall/Ceiling Coating Systems; Interior or Exterior Finish Systems

1.5 DEFINITIONS

- A. Base Coat: Material used to encapsulate one or more layers of reinforcing mesh fully embedded that is applied to the outside surface of the EPS.
- B. Building Expansion Joint: A joint through the entire building structure designed to accommodate structural movement.
- C. Dryvit: Dryvit Systems, Inc., the manufacturer of the Outsulation Plus MD System, a Rhode Island corporation.
- D. EIFS: Exterior Insulation and Finish System; Class PB, non-loadbearing exterior wall cladding system consisting of insulation boards adhesively attached to substrate, integrally reinforced base coat and textured protective finish coat, an integrally incorporated waterproof barrier complete with secondary water control, flashing and drainage provisions.
- E. Expansion Joint: A structural discontinuity in the EIFS System.
- F. Finish: An acrylic-based coating, available in a variety of textures and colors that is applied over the base coat.
- G. Insulation Board: Expanded polystyrene (EPS) insulation board, which is affixed to the substrate.
- H. Reinforcing Mesh: Glass fiber mesh(es) used to reinforce the base coat and to provide impact resistance.
- I. Sheathing: A substrate in sheet form.
- J. Substrate: The material to which the EIFS System is affixed.
- K. Substrate System: The total wall assembly including the attached substrate to which the EIFS System is affixed.

1.6 ACTION SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: For each type and component of EIFS indicated. Demonstrate compliance with specified attributes.

- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Shop Drawings: For EIFS Exterior assemblies
 - 1. Include plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details including mechanical fasteners, and connections and attachments to other work.
 - a. Show complete walls, indicate and detail all joints, rustications and detail shapes.
- E. Samples for Initial Selection: For each type of finish-coat color and texture indicated.
 - 1. Include similar Samples of joint sealants and exposed accessories involving color selection.
- F. Samples for Verification: 24-inch (600-mm-) square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including custom trim, each profile, an aesthetic reveal, a typical control joint filled with sealant of color selected.
 - 1. Include sealants and exposed accessory Samples to verify color selected.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Manufacturer Certificates: Signed by manufacturers certifying that EIFS and joint sealants comply with requirements.
- C. Material or Product Certificates: For cementitious materials and aggregates and for each insulation and joint sealant, from manufacturer.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each water-/weather-resistive barrier, insulation, reinforcing mesh, joint sealant, and coating.
- E. Compatibility and Adhesion Test Reports: For joint sealants from sealant manufacturer indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Field quality-control reports and special inspection reports.
- G. Evaluation Reports: For fasteners water-resistive coating adhesive membrane flashing and EIFS (including insulation), from ICC-ES or other agency acceptable to the Authority Having Jurisdiction.

1.8 CLOSEOUT SUBMITTALS

- A. Refer to Section 01 7700 "Closeout Procedures"
- B. Maintenance Data: For EIFS to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. System Manufacturer: Shall be as specified. All materials shall be manufactured or sold by System Manufacturer and shall be purchased from System Manufacturer or its authorized distributors.
 - 1. Materials shall be manufactured at a facility covered by a current ISO 9001:2000 and ISO 14001 certification. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
- B. Insulation Board Manufacturer: Shall be listed by System Manufacturer, shall be capable of producing the Expanded Polystyrene (EPS) in accordance with current System Manufacturer Specification for Insulation Board and shall subscribe to the System Manufacturer Third Party Certification and Quality Assurance Program.
- C. Installer: Shall be a contractor experienced and competent in the installation of manufacturer's system and shall possess a current System Contractor Certificate issued by System Manufacturer.
- D. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with system components.
- E. Fire-Test-Response Characteristics: Provide EIFS and system components with the following fire-test-response characteristics as determined by testing identical EIFS and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
 - 2. Full-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, complies with UBC Standard 26-4 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies containing foam-plastic insulation.
 - 3. Full-Scale Diversified Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, showing no significant contribution to vertical or horizontal flame spread per ASTM E 108 modified for testing vertical walls.
 - 4. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies containing foam-plastic insulation.
 - 5. Radiant Heat Exposure: No ignition of EIFS when tested according to NFPA 268.
 - 6. Potential Heat: Acceptable level when tested according to NFPA 259.
 - 7. Surface-Burning Characteristics: Provide insulation board, adhesives, base coats, and finish coats with;
 - a. Flame-spread index of 25 or less, per ASTM E 84.

- b. Smoke-developed index of 450 or less, per ASTM E 84.
- F. Mockups: Build Out-Of-Sequence mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution and set quality standards for fabrication and installation.
 - 1. The mock-up shall be of suitable size to accurately represent the products being installed, as well as each color and texture to be utilized on the project.
 - 2. The mock-up shall be prepared with the same products, tools, equipment and techniques required for the actual application. The finish used shall be from the same batch that is being used on the project.
 - 3. The approved mock-up shall be available and maintained at project location as directed by the Architect.
- G. Preinstallation Conference: Conduct conference at Project site.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
 - 1. Stack insulation board flat and off the ground.
 - 2. Protect plastic insulation against ignition at all times.
 - a. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.11 PROJECT CONDITIONS

- A. Weather Limitations: Maintain ambient temperatures above manufacturer's recommended minimums for a minimum of 24 hours before, during, and after adhesives or coatings are applied.
 - 1. Do not apply EIFS adhesives or coatings during rainfall.
 - 2. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.12 COORDINATION

- A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather-resistant sheathing paper, flashing, trim, joint sealants, windows, doors and other wall penetrations such as J-boxes are protected against damage from the effects of weather, age, corrosion, moisture, and other causes.
 - 1. Do not allow water to penetrate behind flashing and drainage plane that is behind water-drainage EIFS.

- B. Provide continuous operation to provide installation free of cold joints, scaffold lines, texture variations and other unacceptable finish defects.

1.13 SEQUENCING AND SCHEDULING

- A. Installation of the Dryvit Architectural Finishes shall be coordinated with other construction trades.
- B. Sufficient manpower and equipment shall be employed to ensure a continuous operation, free of cold joints, scaffold lines, texture variations, etc.

1.14 MAINTENANCE

- A. Maintenance and repair shall follow the procedures noted in Dryvit publication, DS498.
- B. All Dryvit products are designed to minimize maintenance.
 - 1. However, as with all building products, depending on location, some cleaning may be required.
 - a. See Dryvit publication DS152 on Cleaning and Recoating.

1.15 WARRANTY

- A. Contractor shall provide a warranty against defective materials and installation for a period of five (5) years.
- B. Provide additional warranties as follows:
 - 1. Materials: Dryvit manufactured materials will be free of manufacturing defects, will not lose their bond, peel, flake or chip and further, the finish will be fade resistant for a period of ten (10) years.
 - 2. Drainage: Dryvit cladding system will effectively drain any moisture that should enter the wall cavity for a period of ten (10) years.

PART 2 - PRODUCTS

2.1 GENERAL

- A. VOC Limits for adhesives, sealants, fillers, coatings and primers. Comply with limits specified in Section 01 6116.

2.2 MANUFACTURER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Outsulation Plus MD System, Water Managed by Dryvit, a RPM Company, www.dryvit.com or approved product meeting or exceeding properties specified.

2.3 SYSTEM DESCRIPTION

- A. Class PB EIFS:
 - 1. A non-load-bearing, exterior wall cladding system that consists of an insulation board attached adhesively, mechanically, or both to the substrate; an integrally reinforced base coat; mesh reinforcing and a textured protective finish coat.
 - 2. An integrally reinforced base coat; mesh reinforcing and a textured protective finish coat over cast-in-place concrete substrate.
- B. Method of Installation:
 - 1. Field Applied: The Outsulation Plus MD System with Backstop NT is field-applied to the wall substrate.
- C. Expansion Joints: Design and locate expansion joints in the Outsulation System to provide specified performance and comply with design criteria specified. Locate joints as shown on the drawings. Where joints are not shown, request Architect's approval for placement. Show all joints on exterior elevation shop drawings. As a minimum, expansion joints shall be placed at the following locations:
 - 1. Where EIFS abuts dissimilar materials.
 - 2. Where expansion joints occur in the substrate system.
 - 3. Where significant structural movement occurs such as floor lines, changes in roofline, building shape or structural system.
- D. Terminations: Prior to applying the Dryvit Outsulation Plus MD System finish, wall openings within the wall system shall be treated with the Dryvit AquaFlash System or Flashing Tape.
 - 1. The Outsulation Plus MD System shall be held back from adjoining materials around openings and penetrations such as windows, doors and mechanical equipment a minimum of **3/4 -inch (19 mm)** for sealant application.
 - a. See Dryvit's Outsulation Plus MD System Installation Details, DS110
 - 2. The system shall be terminated a minimum of **8 -inches (203 mm)** above finished grade.
 - 3. Sealants shall be compatible with Outsulation Plus MD System materials and approved by Dryvit in writing.
 - 4. The sealant backer rod shall be closed cell material.

2.4 PERFORMANCE REQUIREMENTS

- A. General: Obtain all necessary project data required to calculate and design provisions for the following requirements.
- B. Design Requirements:
 - 1. Deflection of substrate systems shall not exceed 1/240 times the span.
 - 2. The substrate shall be flat within **1/4 -inch (6.4 mm)** in a **4 -feet (1.2 m)** radius.
 - 3. The slope of inclined surfaces shall not be less than 6:12, and the length shall not exceed **12 -inch (305 mm)**.
- C. Thermal Movement: Design to provide for expansion and contraction of materials for exterior ambient temperature range of **35°F** to surface temperature of **160°F** without buckling stress on EIFS assembly, stress of structural elements or fasteners exceeding design loads. Identify range of accommodated thermal movement in shop drawings.

- D. Structural Performance: Design EIFS, anchorage and related components to resist design loads specified in;
1. Section 01 8316 "Exterior Enclosure Performance Requirements"
 2. Section 05 4000 "Cold-Formed Metal Framing".
- E. Structural Movement: Design to accommodate requirements-specified in;
1. Section 01 8316 "Exterior Enclosure Performance Requirements"
- F. Water and Air Penetration:
1. Water penetration is defined as the appearance of uncontrolled water on the indoor face of any part of the work. "Controlled" water or condensation is that which is demonstrably drained harmlessly to the exterior of the work without endangering or wetting adjacent surfaces or insulation, and not visible in the final construction.
 2. No uncontrolled water penetration shall occur when the work is tested in accordance with ASTM E-331 at a pressure differential of **12 psf**.
 3. No uncontrolled water penetration shall occur when the wall is tested in accordance with AAMA 501.1, using a dynamic pressure equal to **12 psf**.
 4. Air Infiltration: Limit air leakage through the work to not exceed **0.06 cfm** per **square foot** of fixed wall area when tested in accordance with ASTM E-283 at a test pressure of **6.24 psf**.
- G. Construction Tolerances: Range of allowable dimensional tolerances as specified in Section 01 8316 "Exterior Enclosure Performance Requirements".
- H. EIFS Performance: Comply with the following:
1. Bond Integrity: Free from bond failure within EIFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
 2. Weathertightness: Resistant to water penetration from exterior into water-drainage EIFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of EIFS and assemblies behind it, including substrates, supporting wall construction, and interior finish, and including a means that allows water entering into an EIFS assembly to drain to the exterior.
- I. The Outsulation Plus MD System shall have been tested as follows:
1. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Abrasion Resistance	ASTM D 968	No deleterious effects after 500 liters (528 quarts)	No deleterious effects after 1000 liters (1056 quarts)
Accelerated Weathering	ASTM G 155 Cycle 1	No deleterious effects after 2000 hours	No deleterious effects after 5000 hours
	ASTM G 154 Cycle 1 (QUV)		No deleterious effects after 5000 hours
Freeze-Thaw	ASTM E 2485 (formerly EIMA 101.01)	No deleterious effects after 60 cycles	Passed - No deleterious effects after 90 cycles
	ASTM C 67 modified	No deleterious effects after 60 cycles	Passed - No deleterious effects after 60 cycles
	ASTM E 2485/ICC-ES Proc.;	No deleterious effects after 10 cycles	Passed - No deleterious effects after 10 cycles

	ICC ES (AC219)***		
Mildew Resistance	ASTM D 3273	No growth during 28 day exposure period	No growth during 60 day exposure period
Water Resistance	ASTM D 2247	No deleterious effects after 14 days exposure	No deleterious effects after 42 days exposure
Taber Abrasion	ASTM D 4060	N/A	Passed 1000 cycles
Salt Spray Resistance	ASTM B 117	No deleterious effects after 300 hours exposure	No deleterious effects after 1000 hours exposure
Water Penetration	ASTM E 331 ICC ES (AC 219)***	No water penetration beyond the inner-most plane of the wall after 2 hours at 299 Pa (6.24 psf)	Passed 2 hours at 299 Pa (6.24 psf)
Water Vapor Transmission	ASTM E 96 Procedure B	Vapor permeable	EPS 5 perm-inch Base Coat* 40 Perms Finish** 40 Perms
* Base Coat perm value based on Dryvit Genesis® ** Finish perm value based on Dryvit Quarzputz® *** AC 219 – Acceptance Criteria for EIFS			

2. Structural

TEST	TEST METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297/E 2134	Minimum 104 kPa (15 psi) – substrate or insulation failure	Minimum 132 kPa (19.1 psi)
Transverse Wind Load	ASTM E 330	Withstand positive and negative wind loads as specified by the building code	Minimum 4.3 kPa (90 psf)* 16 inch o.c. framing, ½ in sheathing screw attached at 203 mm (8 inch) o.c.
* All Dryvit components remain intact – for higher wind loads contact Dryvit Systems, Inc.			

- a. Impact Resistance: In accordance with ASTM E 2486 (formerly EIMA Standard 101.86).

Reinforcing Mesh ¹ /Weight g/m ² (oz/yd ²)	Minimum Tensile Strengths	EIMA Impact Classification	EIMA Impact Range Joules (in-lbs)		Impact Test Results Joules (in-lbs)	
Standard - 146 (4.3)	27 g/cm (150 lbs/in)	Standard	3-6	(25-49)	4	(36)
Standard Plus™ - 203 (6)	36 g/cm (200 lbs/in)	Medium	6-10	(50-89)	6	(56)
Intermediate® - 407 (12)	54 g/cm (300 lbs/in)	High	10-17	(90-150)	12	(108)
Panzer® 15 * - 509 (15)	71 g/cm (400 lbs/in)	Ultra High	>17	(>150)	18	(162)
Panzer 20 * -	98 g/cm (550 lbs/in)	Ultra	>17	(>150)	40	(352)

695 (20.5)	lbs/in)	High				
Detail® Short Rolls - 146 (4.3)	27 g/cm (150 lbs/in)	n/a	n/a	n/a	n/a	n/a
Corner Mesh™ - 244 (7.2)	49 g/cm (274 lbs/in)	n/a	n/a	n/a	n/a	n/a
*Shall be used in conjunction with Standard Mesh (recommended for areas exposed to high traffic) 1. It shall be colored blue and bear the Dryvit logo for product identification.						

b. Fire performance

TEST	TEST METHOD	CRITERIA	RESULTS
Fire Resistance	ASTM E 119	No effect on the fire resistance of a rated wall assembly	Passed 1 hour Passed 2 hour
Ignitability	NFPA 268	No ignition at 12.5 kw/m ² at 20 minutes	Passed
Full Scale Multi-Story Fire Test	UBC Std. 26-4 (formerly 17-6)	1. Resist vertical spread of flame within the core of the panel from one story to the next 2. Resist flame propagation over the exterior surface 3. Resist spread of vertical flame over the interior surface from one story to the next 4. Resist significant lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Intermediate Multi-Story Fire Test	NFPA 285 (UBC 26-9)	1. Resist flame propagation over the exterior surface 2. Resist vertical spread of flame within combustible core/component of panel from one story to the next 3. Resist vertical spread of flame over the interior surface from one story to the next 4. Resist lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Full Scale Multi-Story* (corner test)	ANSI FM 4880	Resist flame propagation over the exterior surface.	Passed; No height restrictions*
* Dryvit FM products must be specified			

3. The Outsulation Plus MD components shall be tested for:
- a. Surface Burning

TEST	TEST METHOD	CRITERIA	RESULTS
Surface Burning Characteristics	ASTM E 84	All components shall have a: Flame Spread \leq 25 Smoke Developed \leq 450	Passed

b. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Reinforcing Mesh Alkali Resistance of Reinforcing Mesh	ASTM E 2098 (formerly EIMA 105.01)	> 21dN/cm (120 pli) retained tensile strength after exposure	Passed
EPS (Physical Properties)			
Density	ASTM C 303, D 1622	15.2-20.0 kg/m ³ (0.95-1.25 lb/ft ³)	Pass
Thermal Resistance	ASTM C 177, C 518	4.0 @ 4.4 °C (40 °F) 3.6 @ 23.9 °C (75 °F)	Pass Pass Pass
Water Absorption		2.5 % max. by volume	Pass
Oxygen Index	ASTM C 272	24% min. by volume	Pass
Compressive Strength	ASTM D 2863	69 kPa (10 psi) min.	Pass
Flexural Strength	ASTM D 1621	172 kPa (25 psi) min.	Pass
Flame Spread	Proc. A	25 max.	Pass
Smoke Developed	ASTM C 203 ASTM E 84	450 max.	

2.5 MATERIALS

- A. Compatibility: Provide water-resistive coating, adhesive, fasteners, board insulation, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by EIFS manufacturer for Project.
- B. Cement: Shall be Type I or II, meeting ASTM C 150, white or gray in color, fresh and free of lumps.
- C. Fluid-Applied Flashings: Water-based polymer material, comply with the VOC content limits specified in related section, manufacturer's recommended type.
 1. Dryvit "AquaFlash" and "AquaFlash Mesh".
- D. Water-Resistive Barriers: Type specified in Section 07 2500.
 1. EIFS manufacturer's standard formulation and accessories for use as water/weather-resistive barriers, compatible with substrate, and complying with physical and performance criteria of ICC-ES AC212.
 2. Sheathing Joint Tape: Type recommended by EIFS manufacturer for sealing joints between and penetrations through sheathing.
- E. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate; and complying with the following:
 1. Low-Emitting Coatings Used as Insulation Adhesive: Adhesives shall comply with the VOC content limits specified in related section.
 2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.

3. Factory-mixed noncementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.
- F. Molded, Rigid Cellular Polystyrene Board Insulation: Comply with ASTM C 578, Type I; EIFS manufacturer's requirements; and EIMA's "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
1. The insulation board shall be manufactured by a board supplier listed by System Manufacturer.
 2. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
 3. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
 4. Dimensions: Provide insulation boards not more than 24 -inches by 48 -inches (610 by 1219 mm) and in thickness indicated but not more than 4 -inches (102 mm) thick or less than thickness allowed by ASTM C 1397.
 5. Foam Shapes: Provide with profiles and dimensions indicated on Drawings.
- G. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per ASTM E 2098; bearing the System Manufacturer logo for identification, complying with ASTM D 578 and the following: (See Part 3 for application Schedule)
1. Intermediate-Impact Reinforcing Mesh: Not less than 12 oz./sq. yd.
 2. High-Impact Reinforcing Mesh: Not less than 15 oz./sq. yd. (509 g/sq. m).
 3. Heavy-Duty Reinforcing Mesh: Not less than 20 oz./sq. yd. (678 g/sq. m).
 4. Strip Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
 5. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
 6. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m).
- H. Base-Coat Materials: EIFS manufacturer's standard mixture complying with [one of] the following requirements:
1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
 2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
 3. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
 4. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.
- I. Waterproof Adhesive/Base-Coat Materials: EIFS manufacturer's standard waterproof formulation, complying with the VOC content limits specified in related section and complying with one of the following:
1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.

2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
- J. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat, comply with the VOC content limits specified in related section.
- K. Finish-Coat Materials: EIFS manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following:
1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
 2. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
 3. Colors: As selected by Architect from manufacturer's full range.
- L. Water: Potable.
- M. Mechanical Fasteners: EIFS manufacturer's standard corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; selected for properties of pullout, tensile, and shear strength required to resist design loads of application indicated; capable of pulling fastener head below surface of insulation board; and of the following description:
1. For attachment to steel studs from 0.033 –inches to 0.112 inches (0.84 to 2.84 mm) in thickness, provide steel drill screws complying with ASTM C 954.
 2. For attachment to light-gage steel framing members not less than 0.0179 inch (0.45 mm) in thickness, provide steel drill screws complying with ASTM C 1002.
 3. For attachment to masonry and concrete substrates, provide sheathing dowel in form of a plastic wing-tipped fastener with thermal cap, sized to fit insulation thickness indicated and to penetrate substrate to depth required to secure anchorage.
 4. For attachment, provide manufacturer's standard fasteners suitable for substrate.
- N. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.
1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 3. Weep Screed/Track: Prefabricated, one-piece type for attachment behind insulation with perforated face leg extended to form a drip and weep holes in track bottom, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of EIFS with drainage.
 4. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.
 5. Window Sill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.

2.6 ELASTOMERIC SEALANTS

- A. Elastomeric Sealant Products: Provide EIFS manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C 1481 and with requirements in Division 07 Section "Exterior Façade Sealants" for products corresponding to description indicated below:
 - 1. Single-component, nonsag, neutral-curing silicone sealant.
- B. Preformed Foam Sealant Products: Provide sealant compatible with adjacent materials and complying with requirements in Division 07 Section "Joint Sealants."
- C. Sealant Color: As selected by Architect from manufacturer's full range.

2.7 MIXING

- A. General: Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of EIFS.
- B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
- C. Verify that roof edges, balconies, deck, penetrations, windows, doors and wall openings are flashed in accordance with EIFS Manufacturer details or as otherwise necessary to prevent water penetration.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Begin coating application only after surfaces are dry.
 - 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.

- C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.
- D. Prepare cast-in-place concrete substrate for application of finish.

3.3 EIFS INSTALLATION, GENERAL

- A. Comply with EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 SUBSTRATE PROTECTION APPLICATION

- A. Primer/Sealer:
 - 1. Apply over gypsum sheathing substrates to protect substrates from degradation and where required by EIFS manufacturer for improving adhesion of insulation to substrate.
 - 2. Apply over concrete substrates to protect substrates from degradation and where required by EIFS manufacturer for improving adhesion of insulation to substrate.
- B. Water-Resistive Coatings: Apply over substrates to protect substrates from degradation and to provide water-/weather-resistive barrier.
 - 1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.
- C. Waterproof Adhesive/Base Coat: Apply over sloped surfaces window sills parapets and where necessary to protect substrates from degradation.
- D. Fluid-Membrane Flashing: Coordinate installation over weather-resistive barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where indicated by EIFS manufacturer's written instructions to protect wall assembly from degradation. Prime substrates, if required, and install flashing to comply with EIFS manufacturer's written instructions and details.

3.5 TRIM INSTALLATION

- A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at window sills, and elsewhere as indicated, according to EIFS manufacturer's written instructions. Coordinate with installation of insulation.
 - 1. Weep Screed/Track: Use at bottom termination edges, at window and door heads, and at floor line expansion joints of panelized EIFS unless otherwise indicated.
 - 2. Window Sill Flashing: Use at windows unless otherwise indicated.
 - 3. Expansion Joint: Use where indicated on Drawings.
 - 4. Casing Bead: Use at other locations.

3.6 INSULATION INSTALLATION

- A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C 1397, EIFS manufacturer's written instructions, and the following:
 - 1. Apply adhesive to insulation by notched-trowel method in a manner that results in coating the entire surface of sheathing with adhesive once insulation is adhered to sheathing

- unless EIFS manufacturer's written instructions specify using primer/sealer with ribbon-and-dab method. Apply adhesive to a thickness of not less than **1/4 -inch (6.4 mm)** for factory mixed and not less than **3/8 -inch (9.6 mm)** for field mixed, measured from surface of insulation before placement.
2. Press and slide insulation into place. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
 3. Allow adhered insulation to remain undisturbed for period recommended by EIFS manufacturer, but not less than 24 hours, before beginning rasping and sanding insulation, or applying base coat and reinforcing mesh.
 4. Mechanically attach insulation to substrate by method complying with EIFS manufacturer's written instructions. Install top surface of fastener heads flush with plane of insulation. Install fasteners into or through substrates with the following minimum penetration:
 - a. Steel Framing: **5/16 -inch (8 mm)**.
 - b. Concrete and Masonry: **1 -inch (25 mm)**.
 5. Apply insulation over drainage mat and dry substrates in courses with long edges of boards oriented horizontally.
 6. Begin first course of insulation from a level base line and work upward.
 7. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior if possible.
 8. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than **12 -inches (300 mm)** wide or **6 -inches (150 mm)** high. Offset joints not less than **6 -inches (150 mm)** from corners of window and door openings and not less than **4 -inches (100 mm)** from aesthetic reveals.
 - a. Adhesive Attachment: Offset joints of insulation not less than **6 inches (150 mm)** from horizontal and **4 -inches (100 mm)** from vertical joints in sheathing.
 - b. Mechanical Attachment: Offset joints of insulation from horizontal joints in sheathing.
 9. Interlock ends at internal and external corners.
 10. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than **1/16 -inch (1.6 mm)** occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
 11. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
 12. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than **1/16 -inch (1.6 mm)** from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than **1/16 -inch (1.6 mm)**.
 13. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than **3/4 -inch (19 mm)**.
 14. Install foam shapes and attach to sheathing.
 15. Interrupt insulation for expansion joints where indicated.
 16. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.

17. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
 18. After installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than **2-1/2 -inches (64 mm)** over front and back face unless otherwise indicated on Drawings.
 19. Treat exposed edges of insulation as follows:
 - a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
 - b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
 - c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
 20. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and water-/weather-resistive barrier.
- B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
1. At expansion joints in substrates behind EIFS.
 2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
 3. At floor lines in multilevel construction.
 4. Where wall height or building shape changes.
 5. Where EIFS manufacturer requires joints in long continuous elevations.

3.7 BASE-COAT AND REINFORCING MESH INSTALLATION

- A. Base Coat: Apply to exposed surfaces of insulation and foam shapes in minimum thickness recommended in writing by EIFS manufacturer, but not less than **1/16-inch (1.6-mm)** dry-coat thickness.
- B. Reinforcing Mesh:
1. Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than **2-1/2 -inches (64 mm)** or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions.
 2. Do not lap reinforcing mesh within **8 -inches (204 mm)** of corners.
 3. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
 4. Schedule: As scheduled unless indicated to be greater weight in Drawings
 - a. Typical:
 - 1) Intermediate-Impact Reinforcing Mesh:
 - b. Within **10 -feet** of a walking surface, but not less than terminated at a material transition or joint in EIFS:
 - 1) Heavy-Duty Reinforcing Mesh: (Not less than Dryvit's Panzer .)

- C. Double-Layer Reinforcing Mesh Application: Where indicated, apply second base coat and second layer of intermediate-impact reinforcing mesh, overlapped not less than 2-1/2 -inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions in same manner as first application. Do not apply until first base coat has cured.
 - 1. Strip Reinforcing Mesh:
- D. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 -inches (100 mm) beyond perimeter. Apply additional 9-inch by 12-inch (230-by-300-mm) strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch (200-mm-) wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 -inches (100 mm) on each side of corners.
 - 1. Detail Reinforcing Mesh:
 - 2. Corner Reinforcing Mesh:
 - 3. At aesthetic reveals, apply strip reinforcing mesh not less than 8 -inches (200 mm) wide.
 - 4. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.
- E. Foam Shapes: Fully embed reinforcing mesh in base coat.
- F. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application except without reinforcing mesh. Do not apply until first base coat has cured.

3.8 FINISH-COAT INSTALLATION

- A. Primer: Apply over dry base coat according to EIFS manufacturer's written instructions.
- B. Finish Coat: Apply over dry base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
 - 1. Texture: As selected by Architect from manufacturer's full range.
 - 2. Embed aggregate in finish coat according to EIFS manufacturer's written instructions to produce a uniform applied-aggregate finish of color and texture matching approved sample.
- C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.9 INSTALLATION OF JOINT SEALANTS

- A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 07 Section "Exterior Façade Sealants" and in ASTM C 1481.
 - 1. Apply joint sealants after base coat has cured but before applying finish coat.
 - 2. Clean surfaces to receive sealants to comply with indicated requirements and EIFS manufacturer's written instructions.
 - 3. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
 - 4. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.

5. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.
6. Recess sealant sufficiently from surface of EIFS so an additional sealant application, including cylindrical sealant backing, can be installed without protruding beyond EIFS surface.

3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. According to ICC-ES AC24.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. EIFS Tests and Inspections: For the following:
 1. According to ICC-ES AC24.
 2. Remove and replace EIFS where test results indicate that EIFS do not comply with specified requirements.
- D. Prepare test and inspection reports.

3.11 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

- END OF SECTION -

- SECTION 07 2500 -**FLUID-APPLIED MEMBRANE AIR-BARRIERS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes Fluid Applied, (Vapor-permeable) Membrane Air Barriers, typically noted as "Weather Resistive Barriers (WRB) on drawings.
 - 1. Penetration and opening flashings.
 - 2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly
 - 3. Building paper behind cement plaster and mortar bed assemblies (scratch & brown coats).

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4339 "Mockup Requirements"
- C. Section 01 4553 "Facade Mockup Testing".
- D. Section 04 2115 "Adhered (Thin) Brick Veneer"
- E. Section 04 4200 "Exterior Stone Cladding"
- F. Section 04 7300 "Manufactured Adhered Stone Masonry"
- G. Section 06 1600 "Sheathing" for exterior sheathing, sheathing joint and penetration treatment.
- H. Section 07 2419 "Exterior Insulation and Finish System (EIFS)"
- I. Section 07 4213 "Metal-Faced Composite Wall Panel Assemblies"
- J. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal flashings.
- K. Section 07 9200 "Joint Sealants" for joint-sealant materials and installation.

- L. Section 07 9213 "Exterior Façade Joint Sealants" for joint-sealant materials and installation.
- M. Section 09 2236 "Metal Lath & Accessories" for materials installed over (WRB) and sheathing.
- N. Section 09 3053 "Exterior Tiling"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 1998.
- C. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; Compliant with Procedure B (Water Method) for interior to exterior testing.
- E. (ABBA) Air Barrier Association of America, www.airbarrier.org, including their Quality Assurance Program, Training and Certification.

1.5 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air-barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
- D. Fluid Applied, (Vapor-permeable) Membrane Air Barriers, typically noted as "Weather Resistive Barriers (WRB) on drawings.

1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site after approval of complete submittal including requirements in Division 1 Section "Project Management and Coordination".
 - 1. Review requirements for air-barrier, including surface preparation specified under other Sections, substrate condition and pretreatment, temporary weather protection, forecasted weather conditions.
 - 2. Review air-barrier requirements and installation procedures, special details and sheet flashings, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air-barriers.
 - 3. Review testing and inspection procedures, and protection and repairs.

1.7 ACTION SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: For each type of product. Demonstrate compliance with specified attributes.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Shop Drawings: For Air-Barriers and Weather-Resistive Barrier assemblies (WRB).
 - 1. Show locations and extent of air-barrier and weather-resistive barrier.
 - a. Include details for substrate joints and cracks, counter-flashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 2. Include details of interfaces with other materials that form part of air-barrier and weather-resistive barrier including related cladding, opening flashings, sealants and flashings.
 - 3. Provide project-specific details customized to this project's conditions.
 - a. Manufacturer's standard details alone are not acceptable.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air-barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.9 QUALITY ASSURANCE

- A. Refer to Section 01 4000 "Quality Requirements"
- B. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by Air-barrier manufacturer.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
 - 2. Installer shall have knowledge of Air-barrier requirements: both theoretical and practical.
 - 3. Installation shall be monitored.

4. Certified Applicators shall be audited to ensure:
 - a. Proper application techniques.
 - b. Manufacturer's instructions have been followed during installation.
 - c. Proper use of equipment.
 - d. On site quality control which documents installation and testing by applicator.
 - e. Proper record keeping.
- D. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
 1. Build integrated mockups of exterior wall assembly **150 sq. ft. (14 sq. m)** , incorporating backup wall construction, external cladding, window, storefront, curtainwall, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air-barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air-barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air-barrier until mockups are approved.
 - d. Mock ups may be coordinated with mock ups required by other exterior material Sections, providing all provisions of this Section are met.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Meeting (Conference): As specified.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Apply air-barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
 1. Protect substrates from environmental conditions that affect air-barrier performance.
 2. Do not apply air-barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.12 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
 - 1. Qualitative Air-Leakage Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers, ASTM E 1186, chamber depressurization with detection liquids.
 - 2. Quantitative Air-Leakage Testing: Mockups will be tested for air leakage according to ASTM E 783.
 - 3. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D 4541.
 - 4. Notify Architect seven days in advance of the dates and times when mockups will be tested.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. General: Air Barrier shall be capable of performing as a continuous vapor-permeable air-barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to adjacent waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- C. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E2178 "Standard Test Method for Air Permeance of Building Materials" and ASTM E 2357 "Standard Test Method for Determining Air Leakage of Air-barrier Assemblies".
- D. Building Envelope shall be constructed with a continuous Air-barrier to control air leakage into, or out of the conditioned space. An Air-barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50 percent of the difference between the conditioned space and design ambient conditions. The air-barrier shall have the following characteristics:
 - 1. Continuous, with all joints made airtight.
 - 2. Capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
 - 3. Durable or maintainable.

4. The air-barrier shall be joined in an airtight and flexible manner to the air-barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
 - a. Foundation and walls.
 - b. Walls and windows or doors.
 - c. Different wall construction and cladding assemblies.
 - d. Wall and roof.
 - e. Wall and roof over unconditioned space.
 - f. Walls, floor and roof across construction, control and expansion joints.
 - g. Walls, floors and roof to utility, pipe and duct penetrations.
5. All penetrations of the air-barrier and paths of air infiltration/exfiltration shall be made airtight.

2.2 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
 1. The same manufacturer as the EIFS cladding specified in the related section.

2.3 VAPOR-PERMEABLE MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Permeable Membrane Air-barrier: **Elastomeric, modified bituminous or synthetic polymer** membrane.
 1. Products: Basis of Design is **Backstop® NT** reference document **DS455 by Dryvit**, www.dryvit.com no substitutions permitted.
 2. Physical and Performance Properties:
 - a. Values below edited specific for Dryvit NT
 - b. Air Permeance: Maximum **0.0006 l/s/m2 @ 75Pa (1.2x10⁻⁴ cfm/ft² @ 1.6psf)**pressure difference; ASTM E 2178.Vapor Permeance (Water Vapor Transmission): Maximum **7 perms** ASTM E 96 Procedure B and ICC ES (AC212) Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing, also referred to as ASTM E 2570. Defined as Class III vapor retarder per the 2009 IBC and IRC.
 - 2) ICC: Vapor Permeable.
 - ~~d.~~ Elongation: **16.8 percent** per ASTM D 2370 Tensile Strength: **160 psi** per ASTM D 2370
 - f. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - g. Surface Burning characteristics per ASTM E 84, ICC and ANSI/EIMA 99-A-2001:
 - 1) Flame Spread: **<25**
 - 2) Smoke Developed: **<450**
 - h. Water Resistance per ASTM D 2247 and ICC ES (AC212) Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing, also referred to as ASTM E 2570.
 - 1) No deleterious effects after (14) fourteen days exposure.

FLUID APPLIED MEMBRANE AIR-BARRIERS

- a) No cracking, checking, rusting, crazing, erosion, blistering, peeling or delamination when viewed under 5x magnification.
- i. Weathering testing per ICC ES Proc., ICC ES (AC212) Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing, also referred to as ASTM E 2570.
 - 1) UV Exposure for a period of 210 hours: Passed
 - 2) Accelerated Aging for 25 cycles of wetting and drying: Passed
- j. Weathering testing per ICC ES Proc., ICC ES (AC212) Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing, also referred to as ASTM E 2570 and AATTCC 127.
 - 1) Hydrostatic Pressure for 549 mm (21.6 -inch) water column for (5) five hours: Passed

2.4 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.
- B. Primer: Liquid primer recommended for substrate by Air-barrier material manufacturer.
- C. Liquid Applied Flashing Materials: Flexible water-based polymer material, ready for use, Dryvit AquaFlash and AquaFlash Mesh.
- D. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, cross-laminated polyethylene film with release liner backing.
- E. Butyl Strip: Vapor retarding, 30 to 40 mils (0.76 to 1.0 mm) thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.
- F. Modified Bituminous Strip: (Transitions to roofing membranes)
 - 1. Confirm application and compatibility to roofing materials.
 - 2. Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- G. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.
 - 1. Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive available in rolls 4 -inches (102 mm) wide by 100 yds (91m) long.
- H. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- I. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- J. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless-steel fasteners.
- K. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft (24- to 32-kg/cu. m) density; flame-spread index of 25 or less

according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

- L. Modified Bituminous Transition Strip: (Transitions to and including; windows, doors, curtainwalls and storefront)
 - 1. Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- M. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- N. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. Momentive Performance Materials Inc.; US11000 UltraSpan.
 - c. Pecora Corporation; Sil-Span.
- O. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.
 - 1. Comply with Section 07 9213 "Exterior Facade Joint Sealants."
- P. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

2.5 WEATHER-RESISTANT SHEATHING PAPER

- A. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D; except with water-resistance rating not less than 1 hour and water-vapor transmission shall be not less than 75 g/sq. m x 24 h..
- B. Basis of Design: 2-ply Super Jumbo Tex 60 Minute, by Fortifiber, ICC ESR-1027.
 - 1. Substitutions: Section 01 2500.

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractor installing the Fluid Applied, (Vapor-permeable) Membrane Air Barriers, typically noted as "Weather Resistive Barriers (WRB) on drawings, shall install it on the entire exterior of the building behind all wall cladding and shall be done by EIFS contractor or an approved applicator in accordance with EIFS manufacturer's requirements.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
 - 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SURFACE PREPARATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air-barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air-barrier.

3.4 JOINT TREATMENT

- A. Gypsum Sheathing: Fill joints greater than 1/4 -inch (6 mm) with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions.
 - 1. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry.
 - 2. Apply a second layer of fluid air-barrier material over joint reinforcing strip.
- B. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of **3 -inches (75 mm)** along each side of joints and cracks.
 - a. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

3.5 TRANSITION STRIP INSTALLATION

- A. General: Install strips, transition strips, and accessory materials according to Air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air-barrier.
 1. Coordinate the installation of air-barrier with installation of roofing membrane and base flashing to ensure continuity of air-barrier with roofing membrane.
 2. Install compatible strip on roofing membrane or base flashing so that a minimum of **3 -inches (75 mm)** of coverage is achieved over each substrate.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air-barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply elastomeric flashing sheet so that a minimum of **3 -inches (75 mm)** of coverage is achieved over each substrate. Maintain **3 inches (75 mm)** of full contact over firm bearing to perimeter frames with not less than **1 -inch (25 mm)** of full contact.
 1. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at **6 -inches (150 mm)** o.c.
 - a. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
 2. Where opening flashing details are not shown, apply elastomeric flashing strips as indicated and in compliance with opening product (window, door, louver, etc) manufacturer's written recommendations..
 3. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

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- H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- I. Seal top of through-wall flashings to air-barrier with an additional 6 -inch (150-mm-) wide, counterflashing strip.
- J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- K. Repair punctures, voids, and deficient lapped seams in strips and transition strips.
 - 1. Slit and flatten fishmouths and blisters.
 - 2. Patch with transition strips extending 6 -inches (150 mm) beyond repaired areas in strip direction.

3.6 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air-barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- B. Membrane Air-barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness.
 - 1. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
 - 2. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil (1.0-mm) dry film thickness, applied in one or more equal coats.
- C. Apply strip and transition strip a minimum of 1 -inch (25 mm) onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 -inches (75 mm) onto each surface according to air-barrier manufacturer's written instructions.
- D. Do not cover air-barrier until it has been tested and inspected by Owner's testing agency.
- E. Correct deficiencies in or remove air-barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements.

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Continuous structural support of air-barrier system has been provided.
 3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 4. Site conditions for application temperature and dryness of substrates have been maintained.
 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 6. Surfaces have been primed, if applicable.
 7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 8. Termination mastic has been applied on cut edges.
 9. Strips and transition strips have been firmly adhered to substrate.
 10. Compatible materials have been used.
 11. Transitions at changes in direction and structural support at gaps have been provided.
 12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 13. All penetrations have been sealed.
- C. Tests: As determined by Owner's testing agency from among the following tests:
1. Qualitative Air-Leakage Testing: Air-barrier assemblies will be tested for evidence of air leakage according to;
 - a. ASTM E 1186, smoke pencil with pressurization or depressurization, ASTM E 1186, chamber pressurization or depressurization with smoke tracers, or ASTM E 1186, chamber depressurization using detection liquids.
 2. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.
 3. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of **30 lbf/sq. in. (207 kPa)** according to ASTM D 4541 for each **600 sq. ft. (56 sq. m)** of installed air-barrier or part thereof.
- D. Air-barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient air-barrier components for retesting as specified above.
- E. Repair damage to air-barriers caused by testing; follow manufacturer's written instructions.

3.8 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- A. General – Behind Cement Plaster and Mortar Bed Substrates: Cover air-barrier membrane with weather-resistant sheathing paper as follows:
1. Cut back barrier **1/2 -inch (13 mm)** on each side of the break in supporting members at expansion- or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum **4 -inch (100-mm)** overlap, unless otherwise indicated.

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B. Building Paper:

1. Apply horizontally with a 2 -inch (50-mm) overlap and a 6 -inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails.
2. Apply second layer horizontally over the first, staggering laps.

3.9 CLEANING AND PROTECTION

- A. Air-barrier Membrane is not suitable for permanent exposure and must be protected from the effects of sunlight until covered by subsequent cladding materials.
- B. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 1. Protect air-barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for longer than the air-barrier manufacturer's maximum recommended number of days, remove and replace air-barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
 2. Protect air-barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- C. Repair damaged weather barrier as recommended by manufacturer.
 1. Damage includes: Rips, tears, cracks, punctures, mechanical damage, mud, marks, chemical and mortar spills.
- D. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- E. Remove masking materials after installation.

- END OF SECTION -

- SECTION 07 2633 -**WATER VAPOR EMISSION CONTROL COATING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Prepare the concrete substrate surface, furnish and install **100 percent** solids, two component, single coat epoxy type, environmentally safe, Moisture Mitigation System and alkalinity control coating system for concrete floor slabs and elevated concrete floor slabs over properly prepared concrete substrate.
- B. Cementitious leveling / underlayment applied over moisture mitigation epoxy coating as required by specific flooring adhesive to be used at each finish flooring condition.
- C. Contractor to include in Contract Sum, verification of all flooring manufacturers substrate requirements for submitted flooring materials in each area to determine remedial work, if any to meet these manufacturer's requirements for water vapor and alkalinity limits.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4000 "Quality Requirements" for independent laboratory qualifications.
- C. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- D. Section 03 3000 "Cast-In-Place Concrete"
- E. Section 03 3500 "Concrete Finishing"
- F. Section 09 0511 "Concrete Floor Preparation".
- G. Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - 1. Owner to engage an Independent laboratory firm to perform testing of all concrete slabs (on grade and elevated) in accordance with ASTM F-2170, no sooner than 45 days prior to the installation of the finished flooring, scheduled to receive adhered floor coverings, such as carpet, resilient tile, resilient sheet goods, rubber tile, cork tile, stone, ceramic tile and porcelain tile.

- H. Division 09 Floor Covering Sections, for installation requirements and to verify compatibility to the manufacturer's adhesives.
- I. Section 09 6013 "Acoustic Underlayment.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Concrete Institute:
 - 1. ACI 318 – Building Code Requirements for Structural Concrete.
- C. ASTM International:
 - 1. ASTM D 1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 - 2. ASTM D 7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - 3. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM E 1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
 - 5. ASTM F 2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 - 6. ASTM F3010 – 13 – Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings.
- D. CRI, Carpet Installation Standard, The Carpet and Rug Institute., www.carpet-rug.org
- E. EPA Method 24 VOC Content Testing.
- F. International Concrete Repair Institute (ICRI) Guideline No. 03732- Selecting and Specifying Concrete; Surface Preparation for Sealers, Coatings and Polymer Overlays.
- G. NWFA, National Wood Flooring Association, Installation Guidelines, www.nwfa.org

1.5 DEFINITIONS

- A. Moisture Mitigation System Control Coating (Water Vapor Emission Control Coating): A sequence of products applied on a concrete floor to isolate moisture and high pH in the concrete from adhesive and finish floor covering.
- B. Moisture Mitigation System Control Barrier: Coating applied on concrete floor that acts as the primary barrier to moisture movement.
- C. Underlayment: Trowelable or pourable patching/leveling compounds to which the finish floor covering is adhered. Underlayment is installed on top of the Moisture Mitigation System Control Barrier.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Include detailed installation requirements, spread rates, joint and crack treatment and final barrier surfaces for floor coverings.
 - 2. Description for method to prepare the concrete surface for floor coating.
 - 3. ASTM Reports: Certified independent laboratory reports for specified ASTM performance.
 - 4. Certificate or letter from manufacturer for applicator showing that applicator has been factory trained to install materials and meet warranty requirements.
 - 5. Environmental: Manufacturer certified letter for material VOC content.
 - 6. Extended Warranty Certificate: Manufacturers standard fifteen (15) warranty for manufacturing defects and on site material performance.
 - 7. Pail Labels: Collect and submit each original pail label of Moisture Mitigation System Control Coating installed.
 - a. Copies are not acceptable.
- B. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents.
- C. Installer Proof of Qualification: Factory licensed, approved or certified applicator certificate signed by the manufacturer.
 - 1. Qualification shall be acceptable by manufacturer to meet warranty period and criteria.

1.7 INFORMATIONAL SUBMITTALS

- A. Manufacturers Specification.
- B. Warranty as specified
- C. Submit a list of product use and performance history for the same formulation and system design, listing reference sources for at least three (3) projects dating back a minimum of five (5) years.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Company specializing in manufacturing water vapor reduction system products specified in this Section with minimum ten (10) years documented experience.
 - 2. The moisture vapor reduction system must be specifically formulated and marketed for water vapor reduction and alkalinity control without change of system design for a minimum of five (5) years.
- B. Installer Qualifications:
 - 1. Installer shall have not less than five (5) years experience installing the selected fluid based coating systems, shall be trained by the manufacturer, certified in accordance with manufacturers specific warranty requirements, experienced in surface preparation and

application of the material and shall be subject to inspection and control by the manufacturer.

- C. Pre-installation Testing:
 - 1. Document floor and building conditions are within acceptable limits of temperature, relative humidity, and concrete condition before proceeding with product application.
 - 2. File a pre-installation checklist with the manufacturer and receive written confirmation of approval to proceed to support manufacturer's warranty.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and moisture mitigation system application workmanship.
 - 1. Mockup area of at least **200 sq ft** in location approved by Architect and/or Owner.
 - 2. Mockup shall include a **5 sq. ft.** area that illustrates the floor preparation without the coating applied.
 - 3. Do not proceed with work until mockup workmanship and underlayment surface appearance are approved by manufacturer's representative and Architect.
- E. Products based on silicate chemistry, potassium, sodium, lithium, and similar formulations, water-based acrylics or water-based moisture mitigation systems are **not** acceptable and will be rejected.
- F. Manufacturer shall provide independent laboratory test reports documenting the Performance criteria for the product as specified.
- G. Installer shall coordinate with contractor regarding all treatments applied to concrete surfaces for compatibility with system, including but not limited to silicates and oils.
- H. Applicator shall be responsible for acceptance of concrete prior to installation of coating system.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.
- B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light.
 - 1. Do not store in areas with temperatures in excess of manufacturer's written instructions.
- C. Handle product in a manner that will prevent breakage of containers and damage products.
- D. Use products before manufacturer's expiration dates.

1.10 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits required by moisture mitigation system manufacturer. Do not install products under environmental conditions outside manufacturer's limits.
- B. Do not apply Moisture Mitigation System Control Coating to unprotected surfaces or when moisture is present on the surface of the concrete.

WATER VAPOR EMISSION CONTROL COATING

- C. Do not apply Moisture Mitigation System Control Coating when air or floor temperature is lower than 50 degrees F (10 degrees C) or expected to fall below this temperature within 24 hours from time of application.
- D. Install Moisture Mitigation System Control Coating only when concrete floor surface temperature is a least 5 degrees Fahrenheit above the dewpoint temperature of the air over the floor. Maintain and document coated floor surface temperature at least 5 degrees Fahrenheit above air dewpoint temperature for at least 24 hours after application.
- E. Allow continuous ventilation and air movement at all times during application and curing process of the moisture mitigation system.
- F. Protect work to prevent damage that will affect performance and the finished underlayment surface.

1.11 WARRANTY

- A. Extended Warranty: Warranty shall provide, at Owner's option, repair or replacement of the Moisture Mitigation System Control Coating and flooring damaged due to failure of the Moisture Mitigation System Control Coating during the warranty period. Warranty definition of damage shall include at least the following:
 - 1. Distress of flooring caused by moisture including but not limited to;
 - a. Adhesive deterioration resulting in loss of flooring bond to the floor;
 - b. Formation of bubbles, mole trails, lumps, bumps, seam separation, or other significant displacement that interferes with the intended use of the flooring;
 - 2. Distress of the Moisture Mitigation System Control Coating including but not limited to;
 - a. Deformation of approved patching/leveling compounds installed under the Moisture Mitigation System Control Coating;
 - b. Adhesive or cohesive failure of Moisture Mitigation System Control Coating components.
 - c. Distress of underlayment above the Moisture Mitigation System Control Coating such as delamination, disbanding, expansion, chemical reaction, or other deformation or displacement that interferes with the intended use of the flooring.
- B. Warranty coverage shall commence on the date of completion of finish flooring installation.
- C. Warranty shall include the replacement of Moisture Mitigation System Control Coating, flooring system, patching compounds, installation accessories flooring materials and labor costs.
 - 1. Warranty shall not exclude or become void due to cohesive substrate failure in the concrete surface due to normal concrete movement.
 - 2. Warranty shall not exclude or become void due to existing substrate as installation of Moisture Mitigation System Control Coating indicates acceptance of site conditions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers, primers and coatings.

1. Comply with requirements specified in Section 01 6116.
- B. Perm Rating:
 1. The installed system shall have been laboratory tested and meet the 0.10 or less perm rating in accordance with ASTM E96, water method and must include 1 -inch Hg (mercury).
- C. Alkalinity:
 1. The installed system shall remain tolerant to alkalinity of 14 pH per ASTM D1308 and up to 100 percent relative humidity per ASTM F2170.
 2. Warrant no loss in moisture-resistance properties for a period of fifteen (15) years of exposure to continuous water contact and pH greater than 8 after final cure of installed system.

2.2 SYSTEM DESCRIPTION

- A. Non-corrosive, low viscosity, high gloss, microbial resistant, moisture-alkaline resistant coating to suppress, control and mechanically restrict water emission and pH level of concrete substrates for compliance with subsequent floor coverings or coating materials.
- B. Moisture Mitigation System Coating Barrier Requirements: It is the intent of this specification section and the Drawings to require a complete barrier system. Any items not specifically specified but necessary for a complete barrier system shall be provided under this section.
 1. Coating shall be compatible with all types of floor covering products, no system failures due to improper installations and contain no water/alkaline soluble compounds.
 2. Coating shall have a sufficient density to reduce water vapor transmission, avoid water vapor damage to other adhered systems and resistant to most commonly encountered acids/solvents in case of topical exposure (spills).
 3. Coating shall be resistant to mold, mildew and biological growth when applied to prepared substrates

2.3 MOISTURE MITIGATION SYSTEM CONTROL SYSTEM

- A. Source Limitations: Provide materials approved by one Moisture Mitigation System Control Coating manufacturer including moisture-resistant concrete patching and leveling compounds for use under Moisture Mitigation System Control Coating, primers, coatings, sand, and underlayment leveling/patching compounds.
- B. Basis of Design: **VAP I 2000 Zero VOC** by **KOSTER Waterproofing Systems**, www.kosterusa.com . Subject to compliance with requirements specified in this section, provide one of the following products:
 1. AC Tech 2170® FC ZERO System by ALLIED Construction Technologies, Inc., www.actamerican.net, www.combimix.com
 2. MC™ RAPID by Ardex Engineered Cements, www.ardexamericas.com.
 3. VaporTight SG3 by AQUAFIN, <http://www.aquafin.net>.
- C. Single Coat System: 2-component, VOC Compliant, 100 percent solids epoxy formulated as a vapor barrier against high moisture and alkalinity in concrete substrates.
 1. Floor preparation in compliance with coating manufacturers written requirements and meeting warranty criteria.

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2. Apply at manufacturer's recommended and tested coverage rate, minimum average to provide maximum 0.1 net perms (grains/hr/sq ft/per 1-inch Hg) water vapor transmission in accordance with independent testing.
 3. Manufacturer's approved bonding agent/primer.
 4. Manufacturer's approved cementitious leveling underlayment.
- D. Moisture Mitigation System Control Coating: Epoxy resins and other chemical compounds; 100 percent solids, specifically formulated chemicals and resins to provide the following properties. Coating product must contain 100 percent epoxy resin solids.
1. Products based on silicate chemistry, potassium, sodium, lithium, water-based and similar formulations or water-based acrylics are not acceptable and will be rejected.
 2. Solid Content: 100 percent
 3. VOC, mixed: 0 g/L
 4. Flash Point: 200° F
 5. Perm Rating, ASTM E96: Not to exceed 0.1 grains/ sq.ft. /hour in Hg.
 6. ASTM D 1308; Insensitivity to alkaline environment up to, and including, pH 14 in a 14 day bath test.
 7. Certify acceptance and exposure to continuous topical water exposure after final cure.
 8. System must be able to perform as required with ASTM F2170 RH Probe readings of 100 percent.
- E. Expansion joint treatment: By Coating manufacturer or approved by coating manufacturer and type recommended to suit site conditions.
1. Basis of Design for KOSTER system:
 - a. KOSTER Joint Sealant FS-H
- F. Non-Moving Crack treatment: By Coating manufacturer or approved by coating manufacturer and type recommended to suit conditions indicated.
1. Basis of Design for KOSTER system:
 - a. KOSTER TA mixed with KOSTER VAP I 2000.
- G. Self-Leveling Primer: By Coating manufacturer or approved by coating manufacturer and type recommended to suit site conditions.
1. Basis of Design for KOSTER system:
 - a. KOSTER VAP I® 06 Primer
 2. Application: Applied over Moisture Mitigation System Coating Control System coating prior to installation of Underlayment.
- H. Self-Leveling Underlayment: By Coating manufacturer or approved by coating manufacturer and type recommended to suit site conditions.
1. Basis of Design for KOSTER system:
 - a. KOSTER SL, Cementitious Underlayment
- I. Surface treatment for concrete contaminated with Soluble Silicates: By Coating manufacturer or approved by coating manufacturer and type recommended to suit conditions indicated.
1. Basis of Design for KOSTER system:
 - a. KOSTER IB.

2. Application: Apply to contaminated concrete prior to Vapor Emission Control System Sealer application

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification: Verify substrate conditions are acceptable for a warranted system.
- B. Verify items which penetrate concrete substrate to receive coating are securely installed to not affect proper installation and warranty requirements.
- C. Surfaces shall be free of water, rain, snow and frost.

3.2 PREINSTALLATION TESTING

- A. Moisture and pH Testing: As specified in related Section 09 0512.
- B. Conduct vapor emissions testing using relative humidity testing in accordance with ASTM F2170 and alkalinity-pH testing .

3.3 PREPARATION

- A. Surface Preparation for vapor emission control and Alkalinity control coating system:
 - 1. Shot blast and prepare the concrete surface to an ICRI CSP-3 to CSP-4 profile.
 - 2. Verify concrete cleaned by shot blasting or other mechanical abrasion as required by coating manufacturer is in accordance with specified requirements.
 - 3. Verify removal of dirt, oils, films, and other materials detrimental to moisture mitigation system coatings application.
- B. Protection: Mask and protect walls, equipment from adjacent work and finishes during installation process.
- C. If concrete floor develops areas of surface roughness greater than ICRI CSP-5 during preparation, apply patching/leveling compound in those areas and re-abrade to produce specified profile.
 - 1. Confirm with moisture mitigation system manufacturer for conditions where floor roughness can be repaired after coating has been installed.
 - 2. Excessively rough concrete cannot be adequately sealed at specified moisture mitigation coating application rates.
- D. Cleaning: Broom-sweep and vacuum slab surfaces to remove contaminants.
- E. Do not acid etch surface.
- F. Do not apply water to surface.

- G. Joints & Cracks: Fill cracks, construction joints, sawcut control joints, and surface irregularities with crack repair compound.
 - 1. Follow manufacturer's recommendations for routing cracks with diamond abrasive wheel to not more than 1-1/8-inch to 1 1/4-inch depth.
 - a. Clean by vacuum to remove dust and residue.
 - 2. Mix and apply crack repair compound according to manufacturer's instructions using gravity feed.
 - 3. Fill cracks to within 1/8-inch of surface, minimum per manufacturers recommendations.
 - 4. Scrape or lightly grind flush after curing if required by manufacturer to provide a level surface for Moisture Mitigation System Control Coating.
 - 5. Fill cracks completely to stabilize against concrete movement and to provide moisture barrier.
- H. Concrete Fiber Reinforcement, if present after shot blasting, shall be burned off, scraped and vacuumed, leaving no fibers protruding from the concrete surface.
- I. Scarification: Scarify slab surfaces, grind near walls and clean joints as required to control product installation.

3.4 MIXING

- A. Use clean containers and mix thoroughly as per manufacturer's requirements to obtain a homogeneous mixture.
 - 1. Use a low speed motor less than 400 rpm and a two bladed Jiffy-type mixing blade unless allowed otherwise by manufacturer.
- B. Do not aerate the material when mixing.
- C. Mix ratios in accordance with manufacturers written instructions.

3.5 INSTALLATION

- A. Apply Moisture Mitigation System Control Coating where relative humidity and alkalinity tests do not meet flooring manufacturers requirements for scheduled floor finishes:
- B. Apply Moisture Mitigation System Control Coating based on relative humidity and alkalinity test results in strict compliance with the manufacturer's written instructions.
- C. Moisture Mitigation System Control Coating System Application:
 - 1. Coverage rates are dependent on the surface texture and porosity of the substrate.
 - 2. Apply sufficient coating to achieve the manufacturer's recommended minimum film thickness using manufacturer's recommended squeegee or roller. Periodically check application rate and wet film thickness. Follow manufacturer's recommended curing times.
 - 3. Apply Moisture Mitigation System Coating at rate per square foot to thickness required to meet the specified perm rating.
- D. Cementitious Underlayment System:
 - 1. Self-Leveling Cementitious Underlayment:

- a. One-coat Moisture Mitigation System Control Coating without sand broadcast, apply primer to coating.
 - 1) Do not exceed manufacturer's recommended application rate and film thickness.
 - 2) Thicker primer can lead to cracking of underlayment.
 - 3) Allow manufacturer's specified cure time.
 - 4) Do not exceed manufacturer's specified open time.
 - 5) Mix and pour the underlayment product on the floor and disperse with the approved spreader, followed by smoothing the material with the approved smoother.
 - 6) Wear cleated shoes to avoid leaving marks.
 - b. Do not exceed maximum application thickness specified by underlayment manufacturer. Provide a smooth, uninterrupted, level finish without bumps, clumps, depressions, or other defects that would reflect through applied resilient sports flooring.
 - c. Floor finish shall be flat to within **1/8 -inch** in **10 -feet**, and as measured by ASTM E1155.
 - 1) Provide Ff of 50 and FI of 30.
2. Inspect and Repair defects:
- a. Inspect hardened underlayment for flatness.
 - b. Lightly sand flat any bumps in the underlayment. Unhydrated or partially hydrated clumps of underlayment cement shall be removed by carefully chiseling and patching with compatible trowel-applied patching compound recommended by underlayment manufacturer. Do not penetrate the moisture mitigation coating.
 - c. Fill low spots with compatible trowel-applied patching compound recommended by underlayment manufacturer. Sand smooth to remove trowel marks.
- E. Allow surfaces to cure and re-apply additional coats as required to form a uniform control layer.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer and installer to guarantee installed Moisture Mitigation System Control Coating is compatible with all specified floor coverings and adhesives.
- B. Post-Installation Testing: Owner's Testing Agency to perform the following testing:
 1. Tensile bond tests: Perform tensile bond tests in triplicate, at the same rate as Relative Humidity testing specified in related section, no sooner than 72 hours after installation is completed, according to ASTM D7234 through entire Moisture Mitigation System Control Coating into concrete substrate. Comply with the following:
 - a. No cohesive failure of leveling underlayment with at least **200 psi**, or tensile failure in concrete substrate with no inter-layer or intra-layer failure of Moisture Mitigation System Control Coating.
 2. Repair failed test locations at no cost to Owner and re-test to demonstrate compliance.

3.7 PROTECTION

- A. Protect moisture mitigation system coating from damage due to traffic, topical water and contaminants during required cure period until acceptance by related floor covering section.

- END OF SECTION -

- SECTION 07 4213 -**METAL-FACED COMPOSITE WALL PANEL
ASSEMBLIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes;
 - 1. Aluminum-Faced Composite Wall Panel Assembly: Panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system:
 - a. Vertical and Horizontal surfaces.
 - b. Soffit and fascia panels.
 - c. Other configurations as indicated.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 8316 "Exterior Enclosure Performance Requirements" for structural and other criteria for delegated design.
- C. Section 05 1200 "Structural Steel Framing" for structural steel framing supporting metal-faced composite metal panels.
- D. Section 05 4000 "Cold Formed Metal Framing" for steel framing supporting metal-faced composite metal panels.
- E. Section 06 1600 "Sheathing" for exterior wall sheathing.
- F. Section 07 2100 "Thermal Insulation"
- G. Section 07 2500 "Fluid Applied Membrane Air Barriers" for Air Barrier and flexible flashings under metal-faced composite metal panels

- H. Section 07 6200 "Sheet Metal Flashing & Trim" for field-formed flashings and other sheet metal work not part of metal-faced composite panel assemblies.
- I. Section 07 9213 "Exterior Façade Joint Sealants" for field-applied sealants not otherwise specified in this section.

1.4 DEFINITION

- A. Metal-Faced Composite Wall Panel Assembly:
 - 1. Metal-faced composite wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.
- B. Water Infiltration: Defined as uncontrolled water leakage through the exterior face of the assembly.
 - 1. Systems not using a construction sealant at the panel joints, i.e.:
 - a. Rout and Return Dry and Rear Ventilated Systems, shall be designed to drain and water leakage occurring at the joints.

1.5 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. AAMA – "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual"
- C. AAMA 611 – Anodized Architectural Aluminum.
- D. AAMA 2605 – Performance Requirement and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- E. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.
- F. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate for extrusions, formed members, sheet and plate materials.
- G. ASTM C 481 – Standard Test Method for Laboratory Aging of Sandwich Constructions.
- H. ASTM D 635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- I. ASTM D 822 – Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- J. ASTM D 1781 – Standard Test Method for Climbing Drum Peel for Adhesives.
- K. ASTM D 1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- L. ASTM D 2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

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- M. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
- N. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- O. ASTM D 3359 – Standard Test Methods for Measuring Adhesion by Tape Test
- P. ASTM D 3363 – Standard Test Method for Film Hardness by Pencil Test.
- Q. ASTM D 4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- R. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- S. ASTM E 108 – Standard Test Methods for Fire Tests of Roof Coverings.
- T. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- U. ASTM E 330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- V. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- W. ASTM E 906 – Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products.
- X. NAAMA – Metal Finishes for Architectural and Metal Products.
- Y. NCCA – National Coil Coatings Association.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of metal wall panel and accessory indicated.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
 - 2. Demonstrate compliance with specified attributes
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Shop Drawings: Show layouts of metal wall panels, including plans, elevations, sections, details, and attachments to other work.
 - 1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 -inches per 12 -inches (1:10).

- D. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Samples for Initial Selection: For each type of metal composite material panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- F. Samples: Submit selection and verification samples for finishes, colors and textures.
 - 1. Selected Samples: Manufacturer's color chips illustrating full range of colors, finishes and patterns available for composite metal panels with factory applied finishes
 - 2. Verification Samples:
 - a. Structural:
 - 1) 12 -inch by 12 -inch (305 × 305 mm) sample composite panels in thickness specified from an available stock color, including clips, anchors, supports, fasteners, closures and other panel accessories, for assembly approval.
 - 2) Include panel assembly samples not less than 24 -inches by 24 -inches (610 × 610 mm) showing 4-way joint.
 - b. Include separate sets of drawdown samples on aluminum substrate, not less than 3 -inches by 5 -inches (76 × 127 mm), of each color and finish selected for color approval.
 - 1) Larger samples of standard colors are available with production-applied coatings.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer's Instructions: Manufacturer's installation instructions.
- C. Professional Engineer Qualifications: Demonstrate compliance with specified requirements.
- D. Product Test Reports: For each product, tests performed by a qualified testing agency.
 - 1. Certified test reports showing compliance with specified performance characteristics and physical properties, or a third party listing documenting compliance to a comparable code section.
- E. Manufacturer's Field quality-control reports.
- F. Sample Warranties: For special warranties.
- G. Material certificates.
 - 1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
- H. Product test reports.

1.8 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 7700.
- B. Maintenance Data: For metal-faced composite panel to include in maintenance manuals.
- C. Specified warranty.

1.9 QUALITY ASSURANCE

- A. Professional Engineer Qualifications:
 - 1. A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
 - a. Engineering services are defined as those performed for installations of roof specialties that are similar to those indicated for this Project in material, design, and extent.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics.
 - 1. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 2. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- C. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Installer Qualifications: An employer of workers who are trained and approved by manufacturer.
 - 1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.
 - 2. Panel fabricator and installer shall be experienced and acceptable to panel manufacturer
- E. Panel and joint system manufacturer Qualifications: Company with a minimum of ten (10) years of continuous experience manufacturing panel material of the type specified:
 - 1. Able to provide specified warranty on finish.
 - 2. Able to provide a list of five (5) other projects of similar size, including approximate date of installation and name of Architect for each.
 - 3. Able to produce the composite material without outsourcing of the coating or laminating process.
 - 4. Able to provide a certificate of registration to ISO 9001-2000.
- F. Fabricator Qualifications: Company with at least three (3) years of experience on similar sized metal panel projects and qualified by panel material manufacturer. Capable of providing field service representation during construction.
- G. Regulatory Code Agencies Requirements: Provide composite fire rated panels which have been evaluated and are in compliance with the following:

1. Building code as specified.
- H. Mockups: Build at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color (drawdown samples to be used for color approval of nonstandard coil coated colors), texture and pattern and workmanship standard. Mockups shall be constructed to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication, performance and installation.
 1. Build mockup of typical metal composite material panel assembly as shown on Drawings, including corner, soffits, sills, supports, attachments, and accessories.
 2. Water-Spray Test: Conduct water-spray test of mockup of metal composite material panel assembly, testing for water penetration according to AAMA 501.2.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.10 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel Installer, metal composite material panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
 8. Review procedures for repair of panels damaged after installation.
 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
 1. Protection: Protect finish of panels by applying heavy-duty removable plastic film during production.

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- 2. Delivery: Package composite wall panels for protection against transportation damage. Provide markings to identify components consistently with drawings.
- 3. Handling: Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.
- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperatures recommended by manufacturer.
 - 1. Storage: Store panels in well-ventilated space out of direct sunlight.
 - a. Protect panels from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
 - b. Slope panels to ensure positive drainage of any accumulated water.
 - c. Do not store panels in any enclosed space where ambient temperature can exceed 120 degrees F (49 degrees C).
 - 2. Damage: Avoid contact with any other materials that might cause staining, denting or other surface damage.
- D. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.
- E. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering.
 - 1. Store metal composite material panels to ensure dryness, with positive slope for drainage of water.
 - 2. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.
- F. Retain strippable protective covering on metal composite material panels during installation.

1.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal-faced composite wall panel fabrication and indicate measurements on Shop Drawings.
 - 1. When possible, take measurements prior to the completion of shop manufacturing and assembly.
 - 2. Where field measurement is not possible, design assemblies for concealed field adjustment to obtain specified tolerances.
- C. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.13 COORDINATION

- A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.14 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Panel Integrity Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace panel components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Special Installer's Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of (2) two years.
- D. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal-faced composite panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330 and have been certified to be without permanent deformation or failures of structural members:
 - 1. Wind loading:
 - a. Basic Wind Speed: As indicated on Drawings.
 - b. Wind Importance Factor: As indicated on Drawings.
 - c. Occupancy Category: As indicated on Drawings.
 - d. Exposure: As indicated on Drawings.
 - e. Uniform Pressure: Minimum design wind pressure of uniform pressure (velocity pressure) of **15.2 lbf/sq. ft. (728 Pa)**, acting inward and outward when tested according to ASTM E 330).
 - 2. Seismic Loads: As indicated on Drawings.
 - 3. Other Design Loads: As indicated on Drawings.
 - 4. Deflection and Thermal Movement:: Provide systems that have been tested and certified to conform to the criteria under wind loading for inward and outward pressure
 - a. Normal Deflection: Deflection of perimeter framing member not to exceed L/175 normal to plane of the wall; deflection of individual panels not to exceed L/60.
 - b. Anchor Deflection: At connection points of framing members to anchors, anchor deflection in any direction not to exceed **1/16 -inch (1.6 mm)**.
 - c. Thermal Movements: Allow for free horizontal and vertical thermal movement due to expansion and contraction of components over a temperature range from Temperature Change (Range): 120 deg F (**67 deg C**), ambient; 180 deg F (**100 deg C**), material surfaces.
 - 1) Buckling, opening of joints, undue stress on fasteners, failure of sealants, or any other detrimental effects of thermal movement will not be permitted.
 - 2) Fabrication, assembly and erection procedures shall take into account the ambient temperature range at the time of the respective operation.
- C. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- D. Air Infiltration: Air leakage of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of wall area when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: **1.57 lbf/sq. ft. (75 Pa)**.
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference at a differential of **210 percent** of inward acting design load:
 - 1. Test-Pressure Difference: **6.24 lbf/sq. ft. (300 Pa)**.

2. Water penetration is defined as the appearance of uncontrolled water in the wall.
 3. Wall design shall feature provisions to drain to the exterior face of the wall any leakage of water at joints and any condensation that may occur within the construction.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; material surfaces .
- G. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
 2. Provide composite fire rated panels that have been evaluated and are in compliance with regulatory code agency requirements specified herein.
 3. Flame Spread: ASTM E84: <25.
 4. Smoke Developed: ASTM E84: <450.
 5. Surface Flammability, Modified ASTM E108: Pass.
 6. Ignition Temperature:
 - a. Flash: ASTM D1929: 716 degrees F (380 degrees C).
 - b. Ignition: 752 degrees F (400 degrees C).
 7. UL 94 V-O Rating.
 8. Meet requirements of ASTM D635 Rate of Burning Evaluation on Plastic.
 9. Meet requirements of ASTM E906 Heat & Visible Smoke Release Rates.
- H. Bond Integrity: Tested for resistance to delamination as follows:
1. Bond Strength (ASTM C297): 427 psi (2.9 MPa) minimum.
 2. Peel Strength (ASTM D1781): 22.5 in-lb/in (100 N-m/m) minimum.
 3. No degradation in bond performance after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F (21 degrees C).
 4. Thermally bonded to the core material in a continuous process under tension.
- I. Production Tolerances:
1. Width: +/- 0.04 -inch/3 feet (1 mm/m).
 2. Length: +/- 0.04 -inch/3 feet (1 mm/m).
 3. Thickness (4 mm Panel): +/- 0.008 -inch (0.2 mm).
 4. Thickness (6 mm Panel): +/- 0.012 -inch (0.3 mm).
 5. Bow: Maximum 0.5 percent length or width.
 6. Squareness: Maximum 0.2 -inch (5.1 mm).
 7. Edges of sheets shall be square and trimmed with no displacement of aluminum sheets or protrusion of core material.
- J. Composite panels shall have a Class "A" building material rating when tested in accordance with ASTM E84 (Steiner Tunnel Test) and shall exhibit a flame spread of 15 and a smoke developed rating of 120, with a center panel joint. Flame spread of 0, smoke developed of 0 with no joint.

METAL-FACED COMPOSITE WALL PANEL ASSEMBLIES

- a. Composite panel shall have passed the ASTM E 108 modified test.
- b. Meet requirements of ASTM D 635 Rate of Burning Evaluation on Plastic.
- c. Meet requirements of ASTM E 906 Heat & Visible Smoke Release Rates.
- d. Meet requirements of ASTM E 84.

2.2 ALUMINUM COMPOSITE MATERIAL BUILDING PANELS

- A. General: Metal-Faced Composite Wall Panel Systems:
 1. Provide factory-formed and -assembled, metal-faced composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.
 2. Aluminum composite material shall be composed of a thermoplastic compound core sandwiched between two aluminum sheets formed into a continuous process.
- B. Basis of Design: **Alucobond, 3A Composites** aluminum composite material as manufactured by **Alcan Composites**, www.alucobond.com or an approved alternate to be selected from the following:
 1. Reynobond Architectural, Alcoa Architectural Products (USA), www.reynobond.com
 2. Centria, www.centriaPerformance.com
 3. Firestone Metal Products, LLC., www.firestonemetal.com
- C. System Type:
 1. Rout and Return Dry.
 - a. System must provide a perimeter aluminum extrusion with integral weather-stripping as approved by panel manufacturer and as detailed.
 - b. System must provide waterproof assembly for all conditions.
 - c. System must provide waterproof assembly for exterior horizontal sloped sill conditions including , but not limited to;
 - 1) 11/A9.5
- D. Panels:
 1. Type: Aluminum-Faced Composite Wall Panels: :
 - a. Assembly: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated and/or anodized aluminum sheet facings as specified.
 - b. Thickness: As indicated on Drawings, but not less than;
 - 1) 0.157 inch (4 mm)
 - c. Core:
 - 1) Standard.
- E. Attachment Assembly Components:
 1. Formed from extruded aluminum .
 2. System shimmed and attached directly to substrate.

2.3 PANEL MATERIALS

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - 1. Surface: Smooth, flat finish.
- B. Panel Sealants:
 - 1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced composite panels and remain weathertight; complying with VOC requirements specified in related sections and as recommended in writing by metal composite material panel manufacturer.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, **G90 (Z275 hot-dip galvanized)** coating designation or ASTM A 792/A 792M, **Class AZ50 (Class AZM150)** aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated.
- C. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.
- D. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads.
 - 1. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating when approved by Architect.
 - 2. Provide EPDM or PVC sealing washers for exposed fasteners.
- F. Panel Sealants: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.
- G. Flexible Waterproof membrane: Type specified in Section 07 2500.

METAL-FACED COMPOSITE WALL PANEL ASSEMBLIES

2.5 PANEL FABRICATION

- A. Composition:
1. Metal-faced composite panel shall be composed of a thermoset phenolic resin core sandwiched between two aluminum sheets formed into a continuous process.
 2. Bond integrity, per ASTM D 1781 and ASTM C 481 Cycle B, shall be a minimum of 40-in lb/in. (Peel strength).
- B. Aluminum Face Sheets; Aluminum Alloy shall be 3105 H25.
- C. General: Shop fabricate to sizes and joint configurations indicated on Drawings.
1. Where final dimensions cannot be established by field measurements, provide allowance for field adjustment as recommended by the fabricator.
 2. Form panel lines, breaks and angles to be sharp and true, with surfaces that are free from warp or buckle.
 3. Fabricate with sharply cut edges and no displacement of aluminum sheet or protrusion of core.
- D. Tolerances
1. Panel bow: Shall not exceed **0.8 percent** of panel overall dimension in width or length.
 2. Panel Thickness: **1/32-inch.**
 3. Length and Width: **1/16-inch.**
 4. Squareness: **1/64-inch per lineal foot.**
 5. Panel dimensions shall be such that there will be an allowance for field adjustment and thermal movement.
 6. Panel lines, breaks and curves shall be sharp, smooth and free of warps or buckles.
 7. Flatness: Panels shall be visually flat.
- E. Attachment System Components: Formed from extruded aluminum or material compatible with panel facing.
1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips and anchor channels as required.
- F. Panel surfaces shall be free of scratches or marks caused during fabrication.

2.6 SYSTEM FABRICATION

- A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. General:
 1. Coil coated with a fluoropolymer paint finish that meets or exceeds values expressed in AAMA 2605 where relevant to coil coatings.
- E. Exterior Finish: (Factory finished)
 1. Fluoropolymer:
 - a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Pencil Hardness - ASTM D 3363 shall be HB-H minimum (Eagle Turquoise).
 - 2) Impact Adhesion - ASTM D 2794 Coating shall show no cracking and no loss of adhesion.
 - 3) Cure Test - NCCA 11-18
 - a) Coating shall withstand 50-plus double rubs of MEK soaked cloth.
 - 4) Humidity Resistance - ASTM D 2247
 - a) Coating shall show no blisters after 3000-hours of 100-percent humidity at 95-degrees F.
 - 5) Salt Spray Resistance - ASTM B 117
 - a) After 3000-hours of exposure to 5-percent salt fog, at 95-degrees F, scored sample shall show none or few #8 blisters, and less than 1/8-average creepage from scribe.
 - 6) Weatherometer Test — ASTM D 822 and G 23

METAL-FACED COMPOSITE WALL PANEL ASSEMBLIES

- a) Coating shall show no cracking, peeling, blistering or loss of adhesion after 2000-hours.
 - b) Chalking Resistance — ASTM D 4214. No chalk greater than #8 after 10-years Florida exposure at 45-degrees S.
 - c) Color Change — ASTM D 2244.
 - d) Color change shall not exceed 5-NBS units after 10-years Florida exposure at 45-degrees S.
 - e) After 5000-hours in Atlas Weatherometer coating shall show no objectionable chalking or color change. Abrasion Resistance — ASTM D 968.
- 7) Coating shall resist 65±15 liters/mil minimum of falling sand.

F. Color:

- 1. Match color and sheen of Curtain Wall mullions.

2.8 ACCESSORIES

- A. All exposed fasteners shall be self-tapping 300 Series Stainless Steel.
- B. All self-drilling fasteners shall be protected with a corrosion resistant finish.
- C. All sealants shall be compatible with panel materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.
 - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
 - 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.
 - 3. Examine that air barrier has been applied to wall surface prior to installing panel system.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.
- C. Panel substructure shall be level and plumb.
- D. Panel substructure shall be structurally sound as determined by Architect/Engineer.

- E. Panel substructure shall be free of defects detrimental to work.
- F. Panel installer shall inspect substructure and shall not proceed with panel erection until any deviations are corrected.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 LIQUID APPLIED MEMBRANE AIR BARRIER INSTALLATION

- A. Coordinate installation as specified in Section 07 2500.

3.3 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.4 METAL COMPOSITE MATERIAL PANEL INSTALLATION

- A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Commence metal-faced composite panel installation and install minimum of 300 sq. ft. (27.8 sq. m) in presence of factory-authorized representative.
 - 2. Shim or otherwise plumb substrates receiving metal composite material panels.
 - 3. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws.
 - a. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
 - 4. Install screw fasteners in predrilled holes.
 - 5. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 6. Install flashing and trim as metal composite material panel work proceeds.
 - 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 8. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 9. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
 - 10. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 - 11. Install panels plumb, level and plumb, in proper alignment and relation to substructure framing and established lines in compliance with fabricator's recommendations.
 - 12. Anchor panels securely in place in accordance with fabricator's approved shop drawings.
 - 13. Comply with fabricator's instructions for installation of concealed fasteners and with provisions of Division 7 for installation of joint sealers.

METAL-FACED COMPOSITE WALL PANEL ASSEMBLIES

- B. Panels shall be erected in accordance with an approved set of shop drawings.
- C. Panel anchorage shall be structurally sound and per engineering recommendations, if required.
- D. Where aluminum materials come in contact with dissimilar materials, a bituminous paint or caulking tape shall be installed to insulate between the dissimilar materials. Factory applied protective paint or G-90 galvanized steel is considered adequate insulation.
- E. Fasteners:
 - 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
 - a. Use of exposed fasteners must be approved by Architect.
- F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.
- G. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
 - 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
 - 2. Where indicated or detailed, secure panel system directly thru wall substrate into wall framing.
- H. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
 - 1. Dry Seal Systems: Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gasket system.
- I. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-turned flanges of wall panels to panel clips with manufacturer's standard fasteners.
 - 1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 7 "Joint Sealants."
 - 2. Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gaskets.

3.5 ACCESSORY INSTALLATION

- A. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 -feet (3 m) with no joints allowed within 24 -inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 -inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 -inch in 20 -feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8 -inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.
- D. Metal composite material wall panels will be considered defective if they do not pass test and inspections.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.
- G. Field Quality Control: Comply with panel system fabricator's recommendations and guidelines for field forming of panels when approved by Architect.

3.8 ADJUSTING

- A. Adjusting:
1. Repair panels with minor damage such that repairs are not discernible at a distance of 10 -feet (3 m).
 2. Remove and replace panels damaged beyond repair.
 3. Remove protective film immediately after installation of joint sealers and immediately prior to completion of composite metal panel work.

METAL-FACED COMPOSITE WALL PANEL ASSEMBLIES

4. Remove from project site damaged panels, protective film and other debris attributable to work of this section.

3.9 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.
- B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- D. Repair panels with minor damage
- E. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- F. Remove strippable film coating (if used) as soon as possible after surrounding material has been installed.
- G. Glass above should typically be washed prior to removing strippable film below.

3.10 PROTECTION

- A. Protection: Protect installed product's finish surfaces from damage during construction.
 1. Institute protective measures as required to ensure that installed panels will not be damaged.

- END OF SECTION -

- SECTION 07 5419 -**POLYVINYL-CHLORIDE (PVC) ROOFING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Fully Adhered PVC membrane roofing system including flashings and other components as follows, but not limited to:
 - 1. Substrate Preparation.
 - 2. Vapor retarder.
 - 3. Roof insulation.
 - 4. Roof substrate boards / cover boards
 - 5. Roof membrane.
 - 6. Roof membrane flashings.
 - 7. Adhesive for flashings.
 - 8. Walkway pads / roll goods.
 - 9. Metal Flashings.
 - 10. Sealants.
 - 11. Electric Field Vector Mapping (EFVM) Screen.
 - 12. Ballast and Protection Layer.

1.3 RELATED REQUIREMENTS

- A. Section 01 8316 "Exterior Enclosure Performance Requirements": Design Loads and Performance Criteria.
- B. Section 06 1053 "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
- C. Section 06 1600 "Sheathing" for sheathing.
- D. Section 07 2100 "Thermal Insulation" for additional batt insulation beneath the roof deck as indicated.
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counter-flashings.

- F. Section 07 7100 "Roof Specialties".
- G. Section 07 7200 "Roof Accessories".
- H. Section 07 9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
- I. Section 10 7316 "Custom Steel Canopies"
- J. Division 22 "Plumbing" for storm drainage piping specialties for roof drains.
- K. Section 07 3363 "Vegetated Roofing Assembly": Components for vegetated roofing on membrane roof.

1.4 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.5 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project. Manufacturer shall have a minimum 10 years' experience with similar projects.
 - 1. Membrane to have no formulation changes in the last twenty (20) years as certified by the manufacturer.
- B. Installer Qualifications: A qualified that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty. The Contractor shall have at least ten (10) years of experience as an applicator with the submitted manufacturer as certified by the manufacturer.
 - 1. Upon completion of the installation and the delivery to manufacturer of a certification that all work has been done in strict accordance with the contract specifications and the manufacturer's requirements, an inspection shall be made by a Technical Representative of manufacturer to review the installed roof system.
 - 2. All work pertaining to the installation of the membrane and flashings shall only be completed by personnel trained and authorized by the manufacturer in those procedures.
- C. Regulatory Requirements:
 - 1. Foam Plastic Insulation: Comply with requirements of Section 2603 in the International Building Code (IBC).
- D. Thermal- and Sound-Insulating Materials, Radiant Barriers, and Vapor Retarders: Comply with requirements of Chapter 7 and Section 719 of the "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

POLYVINYL-CHLORIDE (PVC) ROOFING

- E. Source Limitations: Obtain components including roof insulation fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- F. There shall be no deviation made from the Project Specification or the approved shop drawings without prior written approval by the Architect, the Owner's Representative and the manufacturer.
- G. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- H. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- I. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- J. Preinstallation Roofing Conference: Conduct joint conference at Project site after approval of a complete submittal for both roofing and vegetated roof assemblies.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, installer of vegetated roofing assemblies, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.7 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Material Safety Data Sheets (MSDS): For storage at project site.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Shop drawings shall be project specific beyond standard details published by the manufacturer and show integration to adjacent systems.
 - 1. Base flashings and membrane terminations.

2. Tapered insulation, including slopes.
 3. Roof plan showing orientation of membrane roofing.
 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- D. Samples for Verification: For the following products:
1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
 2. Roof insulation.
 3. Substrate Board.
 4. Walkway pads or rolls.
 5. Metal termination bars.
 6. Battens.
- E. Qualification Data: For qualified Installer and manufacturer.
- F. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of compliance with performance requirements.
- G. Installer's Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- H. The PVC roof membrane manufacturer is to provide documented proof of 5 projects performing for the duration of the specified warranty located in similar climates to the project being specified.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- J. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.
- K. Field quality-control reports.
- L. Maintenance Data: For roofing system to include in maintenance manuals.
- M. Warranties: Sample of special warranties.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 2. All adhesives shall be stored at temperatures between 40 degrees F and 80 degrees F.

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
- E. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability.
- F. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
- G. All materials which are determined to be damaged by the Architect or the manufacturer are to be removed from the job site and replaced at no cost to the Owner.

1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
 - 1. Membrane materials may be installed under certain adverse weather conditions but only after consultation with the manufacturer, as installation time and system integrity may be affected.
 - 2. Do not install if wind is gusting more than 15 miles per hour, or interferes with proper installation.
 - 3. Do not apply roofing membrane when ambient temperature is below 40°F or above 95°F.
 - 4. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
 - 5. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- B. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.
- C. Only as much of the new roofing as can be made weather-tight each day, including all flashing and detail work, shall be installed. All seams shall be cleaned and heat welded before leaving the job site that day.
- D. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.
- E. All surfaces to receive new insulation, membrane or flashings shall be dry. Should surface moisture occur, provide the necessary equipment to dry the surface prior to application.
- F. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.

- G. Uninterrupted waterstops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the Owner.
- H. The contractor is cautioned that certain membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote and some preservative materials. Such materials shall not remain in contact with the membranes. Consult the manufacturer regarding compatibility, precautions and recommendations.
- I. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over felt or plywood over insulation board shall be provided for all new and existing roof areas that receive rooftop traffic during construction.
- J. Prior to and during application, all dirt, debris and dust shall be removed from surfaces by vacuuming, sweeping, blowing with compressed air and/or similar methods.
- K. Follow all safety regulations as required by OSHA and any other applicable authority having jurisdiction.
- L. All roofing, insulation, flashings and metal work removed during construction shall be immediately taken off site to a legal dumping area authorized to receive such materials. Hazardous materials, such as materials containing asbestos, are to be removed and disposed of in strict accordance with applicable City, State and Federal requirements.
- M. All new roofing waste material (i.e., scrap roof membrane, empty cans of adhesive) shall be immediately removed from the site and properly transported to a legal dumping area authorized to receive such material.
- N. Take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.
- O. Flammable adhesives and deck primers shall not be stored and not be used in the vicinity of open flames, sparks and excessive heat.
- P. All rooftop contamination that is anticipated or that is occurring shall be reported to the manufacturer to determine the corrective steps to be taken.
- Q. Verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Report any such blockages in writing (letter copy to the manufacturer) to the Architect for corrective action prior to installation of the roof system.
- R. Immediately stop work if any unusual or concealed condition is discovered and shall immediately notify Architect of such condition in writing for correction. (Letter copy to the manufacturer).
- S. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.

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- T. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.
- U. The adhered membrane shall not be installed under the following conditions without consulting the manufacturer's technical department for precautionary steps:
 - 1. The roof assembly permits interior air to pressurize the membrane underside.
 - 2. Any exterior wall has **10 percent** or more of the surface area comprised of opening doors or windows.
 - 3. The wall/deck intersection permits air entry into the wall flashing area.
- V. Precautions shall be taken when using adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.
- W. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

1.10 WARRANTIES

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories and other components of membrane roofing system. The Warranty shall be Non-Prorated provide for No Dollar Limit (NDL), and shall not exclude ponding water and no time limited shall be assigned for any such ponding water during the warranty period.
 - 2. Warranty Period: Twenty (20) years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

- C. Design Loads and Performance Criteria: As specified in Section 01 8316 and as follows below.
- D. Edge Securement:
 - 1. Provide products designed and tested for wind resistance in accordance with ANSI/SPRI ES-1, as required by the International Building Code, Chapter 15.
 - 2. Comply with "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments. Chapter 15 and Section 1504.5 "Edge Securement for Low-Slope Roofs".
 - 3. Comply with IBC 1504.5 "Edge Securement for Low-Slope Roofs". Provide products designed and tested for wind resistance in accordance with ANSI/SPRI ES-1, as required by the International Building Code, Chapter 15.
- E. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
 - 1. Fire/Windstorm Classification: UL 90, Class A.
 - 2. Hail Resistance: SH.
- F. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- G. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

2.2 PVC MEMBRANE ROOFING

- A. Basis of Design: PVC Sheet: ASTM D 4434, Type II, Grade I, "**Energy Smart**" **Sarnafil G410** Feltback, fiberglass reinforced membrane with a lacquer coating as manufactured by **Sika Sarnafil Inc**, US Division (Sika Corporation Roofing) Canton, MA, tel: (310) 528-3348 or (800) 451-2504, www.usa.sarnafil.sika.com or approved product meeting or exceeding properties specified:
 - 1. PVC sheet: ASTM D 4434, Type III, **Carlisle Sure-Flex FleeceBack FRS 135-mil** (overall) **PVC** fiberglass reinforced membrane.
 - 2. FiberTite-SM-FB, 60-mil.
 - 3. Approved Equal: Substitutions per Section 01 2500.
- B. Basis of Design: Physical properties following properties measured per standard test methods referenced:
 - 1. Overall Thickness (above fleece): **80 mils** minimum, ASTM D638.
 - a. Membrane shall be guaranteed by the manufacturer to be at a minimum the specified membrane thickness as stated in this section for the thickness required.
 - 1) Membrane manufacturer is to guarantee to the building owner that the polymer thickness is as specified above.
 - a) ASTM +/- tolerance for membrane thickness is not accepted for this project.
 - b) Written guarantee is to be signed by the membrane manufacturer's quality control manager and supplied as part of project closeout documents.

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2. Thickness over Scrim: ASTM D4434
 - a. Minimum of **30 mils (0.40mm)** of waterproofing polymers above the reinforcements as documented by a third party source.
3. Breaking Strength (lbf (N), 200 min (890): (Fiberglass reinforcing)
 - a. ASTM D 638 testing
 - 1) Machine Direction: **250 percent** minimum.
 - 2) Cross Direction: **220 percent** minimum.
 - b. ASTM D 751, procedure A testing:
 - 1) Machine Direction: **500 percent** minimum.
 - 2) Cross Direction: **450 percent** minimum.
4. Fleece (Felt) Weight: **6.5 oz. / yard²**

C. Test

1. Tensile Strength:
 - a. ASTM D 638 testing
 - 1) Machine Direction: **1675 psi** minimum; ASTM D 638
 - 2) Cross Direction: **1625 psi** minimum; ASTM D 638
 - b. ASTM D 751, procedure B testing, **8 -inch** by **8 -inch**:
 - 1) Cross Direction: **60 lbf (N)** minimum
 - 2) Machine Direction: N/A.
2. Elongation at Break of Internal fabric:
 - a. ASTM D 638 testing
 - 1) Machine Direction: **250 percent** minimum, ASTM D 638.
 - 2) Cross Direction: **220 percent** minimum; ASTM D 638.
 - b. ASTM D 751 grab method:
 - 1) Machine Direction: **70 percent** minimum.
 - 2) Cross Direction: **100 percent** minimum.
3. Seam Strength: (percent of original)
 - a. ASTM D 638 testing:
 - 1) Pass; ASTM D 638.
 - b. ASTM D 751 grab method:
 - 1) Pass
4. Retention of Properties after Heat Aging: ASTM D3045 (56 days at **176 degrees F**, 670 hours at **240 degrees F**)
 - a. ASTM D638:
 - 1) Tensile Strength, min (**90 Percent** of original): Pass
 - 2) Elongation, min (**90 Percent** of original): Pass
 - b. ASTM D751:
 - 1) Breaking (Tensile) Strength, min (**90 Percent** of original): Pass
 - 2) Elongation, min (**90 Percent** of original): Pass
5. Linear Dimension Change: **6 hours** at **176°F**
 - a. Cross Direction: **0.00 percent**; ASTM D 1204.
 - b. Machine Direction: **0.36 percent**(Carlisle); ASTM D 1204.(Sika does not list
6. Water Adsorption Resistance – weight change (166 hours at 158°F water) ASTM D570:

- a. 2.0 percent (Carlisle) (Sika 1.7)
7. Accelerated Weathering Test / Xenon-Arc Resistance – No cracks/crazing 10x (Florescent Light, UV exposure):10,000hrs., ASTM G154:
 - a. Pass (Sika & Carlisle)
8. Static Puncture Resistance, 33 lbf (15kg) ASTM D 5602:
 - a. Pass (Sika & Carlisle)
9. Dynamic Puncture Resistance, 7.3 ft-lbs (10 J) ASTM D 5635:
 - a. Pass (Sika & Carlisle)
10. Exposed Face Color:
 - a. Typical roof: White (Color 6110 Sika) (White Carlisle).
 - 1) Initial Solar Reflectance (ASTM C1549) (CRRC): 0.83(Sika)(Carlisle 0.87)
 - 2) Initial Thermal Emittance (ASTM C1371) (CRRC): 0.90(Sika)(Carlisle 0.95)
 - 3) 3 year Thermal Emittance (ASTM C1371) (CRRC): 0.86(Sika & Carlisle)
 - 4) Initial Solar reflective index (SRI): 104 (Sika) (Carlisle 110)
 - 5) 3 year Solar reflective index (SRI): 85 (Sika) (Carlisle 0.61)
 - 6) Initial Solar Reflectance (ENERGY STAR – E903):
 - a) Test Method: Solar Spectrum Reflectometer
 - b) Value: 0.87
 - 7) 3 year Solar Reflectance (ENERGY STAR – E903):
 - a) Test Method: Solar Spectrum Reflectometer (uncleaned)
 - b) Value: 0.61
 - b. Exterior Canopies (Refer to Drawings and Section 10 7316)
 - 1) Color to be selected by Architect from the following:
 - a) White
 - b) Tan
 - c) Light Gray
 - d) Patina Green
 - e) Evergreen
 - f) Copper Brown
 - g) Dark Gray
11. Recycled Content:
 - a. Pre-consumer: 5 percent, min.
 - b. Post-consumer: 1 percent, min.
12. Field Seam Strength (lbf./in. (kN/m) ASTM D1876 tested in peel
 - a. 25 (4.4) min, 60 (10.5) typ.
13. Water Vapor Permanence (perms) ASTM E96
 - a. 0.10 max, 0.05 typ.
14. Ozone Resistance (no cracks 7x, 100 pphm, 168 hours) ASTM D1149: Pass

2.3 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
 - 1. Prefabricated outside and inside flashing corners made of 0.060 -inch (60 mil/1.5 mm) thick membrane that are heat-welded to membrane or base flashings.
 - 2. PVC Flashing Membrane: Sarnafil G410 Membrane; a fiberglass reinforced membrane with lacquer coating adhered to approved substrate using Sarnacol adhesive.
 - 3. Sarnastack Universal: Prefabricated injection molded vent pipe flashing, 60 mils thickness.
- C. Bonding Adhesive: Manufacturer's standard, water based for field and low VOC reactivating type adhesive for flashings.
 - 1. Sarnacol 2121 Adhesive, or as recommended by membrane manufacturer, a water-based adhesive used to attach the feltback membrane to the horizontal or near horizontal substrate.
 - 2. Sarnacol 2163 Adhesive, or as recommended by membrane manufacturer, an adhesive to adhere cover board to insulation, and to adhere tapered insulation to rigid insulation.
 - 3. Stabond U148 Adhesive, or as recommended by membrane manufacturer, an adhesive to attach flashing membranes on vertical substrate.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 -inch by 1/8 -inch (25 by 3 mm) thick; with anchors.
 - 1. Termination Stop: Sarnastop; An extruded aluminum, low profile bar used to attach to the roof deck or to walls/curbs at termination, square penetrations and at incline changes of the substrate. Sarnastop is a 1 -inch wide, flat aluminum bar 1/8 -inch thick that has predrilled holes every 6 -inch o.c.
 - 2. Termination Disc: Sarnadisc; A 20 gauge, 2 -inch diameter SAE 1010 steel plate with an AZ 55 Galvalume coating to meet FM 4470 criteria for corrosion resistance used to attach to the roof deck at round penetrations.
- E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 -inch wide by 0.05 -inch (25 mm wide by 1.3 mm) thick, prepunched.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
 - 1. Membrane Fastener for steel roof decks and structural concrete substrates: Sarnafastener-XP; #15, heavy-duty, corrosion-resistant fastener used with Sarnastop, Sarnabar, and Sarnadisc to attach Sarnafil G410 membrane to steel or concrete roof decks. Sarnafastener-XP has a shank diameter of 0.21-inch and a thread diameter of 0.26 -inch. The driving head has a diameter of approximately 0.435 -inch with a #3 Phillips recess for positive engagement.
- G. Cover Board: Provide product as approved by roofing manufacturer for specified assembly.
- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, and other accessories.

1. PVC Clad Metal: Sarnaclad Metal; a PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles.
 - a. Sheet Metal: 24-gauge, G90 galvanized sheet metal with 20 mil (0.5 mm) unsupported Sarnafil membrane laminated on one side.
 - b. Dimensions: 4 -feet by 8 -feet or 4 -feet by 10 -feet
2. Aluminum Tape: Aluminum Foil Tape 425/427. A 5-mil thick, 2 -inch wide pressure sensitive aluminum tape with transparent acrylic adhesive used as a separation layer between small areas of asphalt contamination and the membrane, as a bond-breaker under the coverstrip at Sarnaclad joints, and as separation between PVC membrane and adjacent self-adhesive flashings.
3. Sealant: Sarnafil Multi-Purpose Sealant (for termination details), Sika 1A and Sika 11FC, compliant with requirements for sealants specified in Section 07 9213.

2.4 VAPOR RETARDER

- A. Self-Adhered Laminated Sheet: Composed of SBS modified bitumen. The top surface is a high-density polyethylene grid laminated between two layers of polyethylene film. A silicone release plastic film covers the self-adhesive reinforced with woven fiberglass yarn with maximum permeance rating of 0.50 perm (29 ng/Pa x s x sq. m).
 1. Products: Subject to compliance with requirements, available manufacturers offering products that meet or exceed performance requirements may be incorporated into the Work include:
 - a. Sarnavap - Self Adhered; Sika Sarnafil

B. Physical Properties:

	ASTM	
Parameters	Test Method	Typical Physical Properties
Thickness	--	32 mil (0.8 mm)
Gross/Net Coverage Per Roll	--	500/468 sq. ft. (46.5/43.5 m ²)
Top Face	--	Polyethylene Woven Composite Facer
Underface	--	Silicone Release Film
Breaking Strength, MD/XD	D 5147	64/88 lbf./in. (11.3/15.4 kN/m)
Ultimate Elongation, MD/XD	D 5147	52/24%
Cold Bending	D 5147	-31°F -35°F
Static Puncture	D 5601	90 lbs (400 N)
Tear Resistance, MD/XD	D 5601	84/90 lbf. (375/400 N)
Lap Adhesion	D 1876	6 lbf./in. (1050 N/m)
Peel Strength	D 903	8 lbf./in. (1400 N/m)
Water Absorption	D 5147	<0.1 percent
Water Vapor Permeance	E 96	0.017 perm 0.92 ng/Pa s m ²
	(Procedure B)	
Air Permeability	D 1970	1.14 10 ⁻³ ft ³ / 0.007 L/sec m ²
	(75 pa)	min. sq. ft.

2.5 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8 -inch thick.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Georgia-Pacific Corporation; Dens Deck, Prime.
- B. Parapet Sheathing (as roofing substrate):
 - 1. Refer also to Section 06 1600.
 - 2. Roofing Manufacturers approved gypsum, fire-tested hardboard.
 - a. Georgia Pacific DensDeck Prime® provide 4 -feet by 8 -feet board size and in 1/2 -inch minimum thickness.
- C. Substrate Sheathing over metal deck:
 - 1. Refer also to Section 06 1600.
 - 2. Roofing Manufacturers approved gypsum, fire-tested hardboard.
 - a. Georgia Pacific DensDeck Prime® provide 4 -feet by 8 -feet board size and in 5/8 -inch minimum thickness.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.6 COVER BOARDS

- A. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 1/2 -inch (16 mm) thick.
 - 1. Roofing Manufacturers approved and included in their warranty.
 - a. Installed over rigid roof insulation with staggered joints.
 - 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Georgia-Pacific Corporation; Dens Deck, Prime.
 - 3. Sheathing:
 - a. Refer also to Section 06 1600.
 - b. Installed over rigid roof insulation with staggered joints.
 - c. Roofing Manufacturers approved gypsum, fire-tested hardboard.
 - 1) Georgia Pacific DensDeck Prime® provide 4 -feet by 8 -feet board size and in 1/2 -inch minimum thickness.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.7 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or provided by and included within the PVC roof membrane manufacturer's system warranty, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Closed Cell Extruded-Polystyrene Board Insulation: ASTM C 578, Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, minimum 1/4 -inch per foot otherwise.
 - 1. Sarnatherm **XPS – FA** by Sarnafil
 - a. Product manufactured to be fully adhered
- C. Minimum thickness over roof deck 2 -inches for thermal resistance of R10 minimum and average thermal resistance of R20.

2.8 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Bead Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- C. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

2.9 WALKWAYS

- A. Rolled-out walkway protection mat used to protect PVC roofing membrane from mechanical abuse. Crossgrip Walkway is 9/16 -inch thick flexible PVC with a heavily textured surface. Crossgrip Walkway is loose laid on top of completed Sarnafil roof assemblies.
 - 1. Product: Crossgrip walkway.
- B. Flexible Walkway Pads: A polyester reinforced, 0.096 inch, weldable membrane with surface embossment, used as a protection layer from rooftop traffic.
 - 1. Product: Sarnatred manufactured by Sika Sarnafil.

2.10 MISCELLANEOUS ACCESSORIES

- A. Aluminum Tape: 2 -inch (50 mm) wide pressure-sensitive aluminum tape used as a separation layer between small areas of asphalt contamination and the membrane and as a bond-breaker under the coverstrip at joints.
- B. Sealing Tape Strip: Compressible foam with pressure-sensitive adhesive on one side. Used with metal flashings as a preventive measure against air and wind blown moisture entry.
- C. Multi-Purpose Tape: A high performance sealant tape with used with metal flashings as a preventive measure against air and wind blown moisture entry.

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- D. Welder 641mc: 220 volt, self-propelled, hot-air welding machine used to seal long lengths of the membrane seams.
- E. Perimat Welder: 120 volt, self-propelled, hot-air welding machine used to seal long-lengths of the membrane seams along perimeter details.
- F. Cleaner A high quality solvent cleaner used for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface. Solvent is also used daily to clean seam areas prior to hot-air welding in tear off or dirty conditions or if the membrane is not welded the same day it is unrolled. Consult Product Data Sheet for additional information.

2.11 MISCELLANEOUS FASTENERS AND ANCHORS

- A. All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel.
 - 1. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion.
 - 2. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins.
 - 3. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 -inch (25 mm) and shall be approved for such use by the fastener manufacturer.
- B. Wood Nailers & Blocks: Treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on Project Drawings.
 - 1. Thickness of nailers must match the insulation thickness to achieve a smooth transition. Wood nailers shall be treated for fire and rot resistance (wolmanized or osmose treated) and be #2 quality or better lumber.
 - a. Creosote or asphalt-treated wood is not acceptable.
 - 2. Wood nailers shall be treated for fire and rot resistance (wolmanized or osmose treated) and be #2 quality or better lumber. Creosote or asphalt-treated wood is not acceptable. Wood nailers shall conform to Factory Mutual Loss Prevention Data Sheet 1-49.
 - 3. All wood shall have a maximum moisture content of 19 percent by weight on a dry-weight basis.

2.12 PROTECTION LAYERS

- A. Sarnafil PVC Protection Layer (permanent flashing membrane and temporary field protection):
 - 1. Fiberglass reinforced, 0.051 -inch thick PVC recycled content membrane to protect waterproofing membrane from mechanical damage.

2.13 EFVM VECTOR MAPPING GRID AND CONNECTIONS

- A. Vector Mapping Grid (VMG™)
 - 1. A specially selected 2 -inch by 2 -inch (50 mm x 50 mm) 304 stainless steel grid that serves as a conductive medium below the membrane used in conjunction with EFVM®.
- B. EFVM Connection Kit
 - 1. Connects the Vector Mapping Grid to the leak detection equipment. It consists of two (2) 0.45 mm, 6 -inch by 6 -inch SS 304 stainless steel EFVM connection plates, insulated,

exterior graded 16 gauge low voltage wire, 5 -feet 6 -inch in length. The EFVM Connection Kit is utilized to electrically energize the Vector Mapping Grid during the EFVM test.

- C. Geonet B (permanent field protection/drainage layer EFVM compatible): Prefabricated protection/ drainage composite with a polymeric drainage net and polypropylene geotextile laminated to both sides.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 5. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 SUBSTRATE BOARD

- A. Install substrate board over metal deck with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.4 VAPOR-RETARDER INSTALLATION

- A. Install adhered over a clean and dry substrate. In concrete applications allow concrete to cure for at least 28 days. Do not install when it is raining, snowing, or on wet/humid surfaces. Install in temperatures 32°F (0°C) and above.
- B. Laminate Sheet: Install laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 3 -inches (75 mm) and 6 -inches (150 mm), respectively. Bond vapor retarder to substrate as follows:
 - 1. The use of a primer is required on concrete decks and glass mat boards.
 - 2. Begin application at the bottom of the slope. Unroll adhered onto the substrate without adhering for alignment. Overlap each preceding sheet by 3 -inch (75 mm) lengthwise following the reference line and by 6 -inch (150 mm) at each end. Stagger end laps by at least 12 -inch (300 mm). Do not immediately remove the silicone release sheet.
 - 3. Once aligned, peel back a portion of the silicone release sheet and press the membrane onto the substrate for initial adherence. Hold adhered membrane tight and peel back the release sheet by pulling diagonally.
 - 4. Use a 75 lb. (34 kg) roller to press vapor retarder membrane down into the substrate including the laps. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut the membrane to remove air bubbles trapped under the laps. Squeeze out air bubbles by pushing the roller to the edge of the laps
- C. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.5 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 -inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 -inches (150 mm) in each direction.

1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding **1/4 -inch (6 mm)** with insulation.
 1. Cut and fit insulation within **1/4 -inch (6 mm)** of nailers, projections, and penetrations.
- G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation position while walking it in place.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of **6 -inches (150 mm)** in each direction. Loosely butt cover boards together.
 1. Adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing and install according to adhering membrane roofing system manufacturer's written instructions.
 1. Install sheet according to ASTM D 5036.
- B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Pour Sarnacol 2121 adhesive out of the pail and spread using notched **1/4 -inch** by **1/4 -inch** by **1/4 -inch (6 mm x 6 mm x 6 mm)** rubber squeegees or roller application in accordance with Sika Sarnafil Roofing Technical Bulletin #03-11, as recommended by the Sika Sarnafil representative in writing. Apply the 2121 adhesive at a rate according to Sika Sarnafil requirements. No adhesive is applied to the back of the G410 membrane.
- E. Unroll the G410 membrane immediately into the wet 2121 adhesive. Adjacent rolls overlap previous rolls by **3 -inches (75 mm)**. This process is repeated throughout the roof area. Immediately after application into adhesive, each roll shall be pressed firmly into place with a water-filled, foam-covered lawn roller by frequent rolling in two directions. Do not allow adhesive to skin-over or surface-dry prior to installation of G410 membrane.
- F. Membrane seams are heat-welded. Do not apply roof membrane when ambient temperature is below **50° F (10° C)**.
- G. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

POLYVINYL-CHLORIDE (PVC) ROOFING

- H. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Revise number of seam tests in first subparagraph below to suit Project.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
 - 4. Weld G410 coverstrips at all G410 feltback seams that do not have a factory selvage edge.
 - 5. Complete all seams by end of day.
 - 6. T-Joints (three-way overlaps): When welding a three-way overlap, the top edge of the second sheet shall be shaved down to create a smooth transition for the top membrane layer to conform to for welding. Chamfer the edge of the membrane.
- J. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.
 - 1. Solidly coat drain bowl flange with sealant. Install a 36 -inch square piece of PVC flashing over the drain. Fasten clamping ring in a solid bed of sealant on top of the PVC and trim the PVC within 1 -inch (25 mm) of inside edge of clamping ring. Lap outer edge of flashing sheet onto deck sheet a min. of 6 -inch and heat weld.
- K. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.
- L. Install Termination Stop around all square penetrations including equipment curbs, and Termination Disc around all round penetrations including drains, pipes, standoffs, and any other membrane terminations within the field.
 - 1. Fasten in accordance with Manufacturer's requirements at a minimum of 4 -inch o.c.
- M. Install Termination Bars and termination reinforcement at membrane perimeters at parapet walls.
 - 1. Fasten in accordance with Manufacturer's requirements at a minimum of 12 -inch o.c.
 - 2. Provide Sarnacord at the perimeter side of the securement strips.

3.7 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing.
 - 1. Do not apply to splice area of membrane roofing.
- C. Apply bonding adhesive to substrate in smooth, even coats with no gaps, globs or similar inconsistencies.
 - 1. Do not apply to seam area of flashing.

- D. Flashing membranes shall be mechanically fastened along the top edge through manufacturer's provided stainless steel discs or termination bars fastened at a maximum of 12 -inch o.c., or through pre-drilled metal strips.
- E. Install securement strip fastened 12 -inch o.c. with acceptable fasteners into the structural deck, at the base of parapets, walls and curbs according to membrane manufacturer's recommended details. Hot-air weld PVC cord onto the waterproofing membrane on the penetration side of the securement strip.
- F. Flashings shall extend a minimum of 8 -inch above the membrane surface unless previously accepted by the membrane manufacturer, the Owner, and the architect/engineer.
- G. All flashings that exceed 30 -inch in height shall receive additional securement.
 - 1. Consult manufacturer for securement methods.
- H. Flashing membranes shall be adhered to substrates.
 - 1. Interior and exterior corners and miters shall be cut and hot-air welded into place.
- I. Flash penetrations and field-formed inside and outside corners with manufacturer's prefabricated components or G410 glass fiber reinforced sheet flashing.
- J. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive.
 - 1. Hot-air weld side and end laps to ensure a watertight seam installation.
- K. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars in accordance with membrane manufacturer's recommended details.
- L. No bituminous elements shall be in contact with the waterproofing membrane.
 - 1. Apply aluminum tape over PVC membrane at transitions to bituminous sheet membranes.
 - 2. Confirm transition detailing with manufacturer in writing.
- M. Flashings shall be installed concurrently with the membrane in order to maintain a watertight condition as the work progresses.

3.8 WALKWAY INSTALLATION

- A. Cross-Grip Walkway (with loops)
 - 1. Provide Crossgrip Walkway loose laid on top of completed PVC roof assembly. Secure the walkway with loops of Sarnafil membrane welded to the field sheet each side of the walkway at 3 -feet intervals. Unroll and position Crossgrip Walkway within specified areas and cut to desired length. Do not install Crossgrip Walkway directly over termination or hurricane bars. Provide connecting clips at butt joints. Check all existing deck membrane seams that are to be covered and reweld any inconsistencies before installation.
- B. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions to prevent movement due to high winds and maintenance personnel.

3.9 PROTECTION LAYER INSTALLATION

- A. Install protection layers over completed membrane assemblies as soon as possible. Coordinate this work with owner and Sika Sarnafil's representative to allow inspection and acceptance of membrane and water tests before installation of protection layers.
- B. Leave roof areas in condition to receive vegetated roofing assemblies, where these are indicated to occur on drawings.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Leak Detection and Flood Testing: Perform both Electronic Leak Detection and Flood Testing in the order described below.
 - 1. Electronic Leak Detection: Owner will engage Testing Agency to perform Electric Field Vector Mapping (EFVM) leak testing of completed membrane after completing and protecting membrane roofing but before placing overlaying construction. Test each deck area for leaks according to recommendations of EFVM equipment manufacturer.
 - a. Provide written test report with roof plan indicating all located leaks.
 - b. Provide photographs of all leaks.
 - c. Table of leak locations.
 - 2. Repair membrane to eliminate leaks and re-test with EFVM until leak-free performance is obtained.
 - a. Obtain Testing Agency verification of leak repair.
 - 3. Flood Testing: Following successful completion of EFVM testing, flood test each deck area for leaks, according to recommendations in ASTM D 5957. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - a. Flood to an average depth of 2-1/2 -inches (65 mm,) with a minimum depth of 1 -inch (25 mm) and a maximum depth of 4 -inches (100 mm). Maintain 2 -inches (50 mm) of clearance from top of sheet flashings.
 - b. Flood each area for 48 hours.
 - 4. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.
- F. Owner will engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.11 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.12 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: HANSJI Corporation
 2. Address: <Insert address>.
 3. Building Name/Type: Luhrs Marriott Courtyard / Residence Inn
 4. Address: <Insert address>.
 5. Area of Work: <Insert information>.
 6. Acceptance Date: <Insert date>.
 7. Warranty Period: <Insert time>.
 8. Expiration Date: <Insert date>.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 90 mph (m/sec);
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work

covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

- END OF SECTION -

- SECTION 07 6200 -**SHEET METAL FLASHING AND TRIM**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes sheet metal flashing and trim in the following categories:
1. Exterior vertical rain shedding expansion joint covers between existing parking garage (Parkade) wall and new building wall.
 - a. Refer to the following, but not limited to; 7 & 9/A9.7
 - b. Coordinate with horizontal seismic joint cover, refer also to Section 07 9523.
 2. Coordination with exterior rain shedding seismic joint cover between existing parking garage (Parkade) metal roof decking and new building walls.
 - a. Coordinate with horizontal seismic joint cover, refer also to Section 07 9523.
 - b. Refer to the following, but not limited to; 24/A9.7
 3. Roof-drainage systems.
 4. Metal flashing.
 5. Overhead-piping safety pans.
 6. Counterflashings over base flashing.
 7. Counterflashings at roof mounted equipment and vent stacks.
 8. Counterflashings at walls and penetrations.
 9. Extruded metal reveal trim
 10. Other components.
 11. Stainless steel flashing tie in between below grade waterproofing (Section 07 1326) and concrete wall above exterior paving/flatwork.
 12. Related requirements
- B. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- C. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers.
- D. Section 07 1326 "Self-Adhered Sheet Membrane Waterproofing " for below grade waterproofing counter-flashings.
- E. Section 07 2419 "Exterior Insulation and Finish System (EIFS)".

- F. Section 07 2500 "Fluid-Applied Membrane Air Barriers" for integration with flexible flashings.
- G. Section 07 4213 "Metal-Faced Composite Wall Panel Assemblies".
- H. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing" to be installed in conjunction with roofing system by same installer and warranty.
- I. Section 07 7100 "Roof Specialties" for manufactured roof specialties not part of sheet metal flashing and trim.
 - 1. Reglets.
 - 2. Copings
- J. Section 07 7200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
- K. Section 07 9213 "Exterior Façade Sealants" for façade cladding sealants.
- L. Section 07 9500 "Expansion Control" for manufactured sheet metal expansion-joint covers.
- M. Pertinent sections specifying exterior cladding and finish assemblies, curtainwall, windows, doors and façade openings requiring flashing.
- N. Section 10 7316 "Custom Steel Canopies"

1.3 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM A-446 Specification for steel sheet
- C. ASTM A792 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process
- D. ASTM B32 Solder Metal
- E. ASTM B486 Paste Solder
- F. ASTM D226 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- G. ASTM D486 Asphalt Roof Cement, Asbestos-free
- H. FS O-F-506 Flux, Soldering, Paste and Liquid
- I. WH Warnock Hersey International, Inc. Middleton, WI.
- J. FM Loss Prevention Data Sheet
- K. NRCA National Roofing Contractors Association - Roofing Manual
- L. SMACNA Architectural Sheet Metal Manual

1.4 SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
 - 1. Metal material characteristics and installation recommendations.
 - 2. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specific can be approved
 - 3. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.
 - 1. For manufactured and shop fabricated edge metal, fascia, scuppers, and all other sheet metal fabrications.
 - 2. Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.
 - 3. Indicate type, gauge and finish of metal.
- E. Submit two samples, 12 -inch by 12 -inch in size illustrating typical external corner, internal corner, valley, junction to vertical dissimilar surface, material and finish
- F. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
 - 1. 8-inch (200-mm-) square Samples of specified sheet materials to be exposed as finished surfaces.
 - 2. 12-inch (300-mm-) long Samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.
- G. Certification
 - 1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable to roof manufacturer.
 - 2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
- H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a minimum five (5) year fabrication and installation record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.
- B. Stack performed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

1.7 WARRANTY

- A. Contractor's Warranty
 - 1. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be water-tight and secure for a period of five (5) years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

B. Manufacturer's Warranty

1. Pre-finished metal material shall require a written twenty (20) year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

1.8 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.
 1. Fabricate and install flashings at roof edges to comply with requirements specified in the related sections specifying roofing.

2.2 METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 1. Finish: 4 (polished directional satin).

2.3 UNDERLAYMENT MATERIALS

- A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
- B. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.
- C. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil (0.15-mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

2.4 REGLETS

- A. Types specified in Section 07 7100.

2.5 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Solder:
 - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
- B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
- C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.
- D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- E. Elastomeric Sealant: ASTM C 920, silicon sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight, recommended by sheet metal manufacturer and fabricator of components being sealed, complying with requirements specified in Division 7 Section "Exterior Façade Sealants."
- F. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.
- G. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- H. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- I. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.
- J. Gutter and sump drain bulbs: Stainless steel wire type. Heaviest gauge available

2.6 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- E. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

SHEET METAL FLASHING AND TRIM

2.7 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements and as recommended by referenced standards, but not less than that listed below for each application and metal.
- B. Splash Pans: Fabricate from the following materials:
 - 1. Stainless Steel: 0.0187 -inch (0.5 mm) thick.
 - 2. Terne-Coated Stainless Steel: 0.018 -inch (0.5 mm) thick.
- C. Drip Edges: Fabricate from the following material:
 - 1. Stainless Steel: 0.0187 -inch (0.5 mm) thick.
- D. Equipment Support Flashing: Fabricate from the following material:
 - 1. Stainless Steel: 0.025 -inch (0.64 mm) thick.
- E. Overhead-Piping Safety Pans: Fabricate from the following material:
 - 1. Stainless Steel: 0.025 -inch (0.64 mm) thick.
- F. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch (2400-mm-) long, but not exceeding 12-foot (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 -inches (150 mm) beyond each side of wall openings; and form with 2-inch (50-mm-) high, end dams. Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 -inch (0.4 mm) thick.
- G. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 -inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch (50-mm-) high, end dams. Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 -inch (0.4 mm) thick.
- H. Flashing not otherwise specified: Fabricate from the following materials:
 - 1. Stainless Steel: 0.0187 -inch (0.5 mm) thick, minimum and thicker as required to comply with referenced standards.

2.8 CONCEALED THROUGH-WALL SHEET METAL FLASHING

- A. Material: Fabricate from the following metal:
 - 1. Stainless Steel: 0.0156 inch (0.4 mm) thick.
- B. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch (2400-mm-) long, but not exceeding 12-foot (3.6-m-) long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 -inches (150 mm) beyond each side of wall openings. Form with 2-inch (50-mm-) high, end dams where flashing is discontinuous. Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 inch (0.40 mm) thick.
- C. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 -inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch (50-mm-) high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 -inch (0.40 mm) thick.

2.9 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Types specified in Section 07 7100.
- B. Roof and Roof to Wall Transition Expansion-Joint Cover: Fabricate from the following materials:
 1. Stainless Steel: 0.025 -inch (0.64 mm) thick.
- C. Base Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.019 -inch (0.48 mm) thick.
- D. Counterflashing: Fabricate from the following materials:
 1. Stainless Steel: 0.019 -inch (0.48 mm) thick.
- E. Flashing Receivers: Fabricate from the following materials:
 1. Stainless Steel: 0.016 -inch (0.40 mm) thick.
- F. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.019 -inch (0.48 mm) thick.
- G. Roof-Drain Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.016 -inch (0.40 mm) thick.

2.10 UTILITY THROUGH WALL PENETRATION FLASHINGS

- A. Prefabricated facility services utility penetration flashings, sizes and profiles required to suit conditions.
- B. Ten (10) year warranty.
- C. Manufacturer: **Quickflash Weatherproofing Flashing Panels** as manufactured by **Quickflash Weatherproofing Products, Inc.**, www.quickflashproducts.com, 4129 Wagon Trail Avenue, Las Vegas, Nevada 89118. Phone (702) 614-6100. Fax (702) 614-4090. Website www.quickflashproducts.com. E-mail qfinfo@quickflashproducts.com.
- D. References:
 1. ASTM D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
 2. ASTM D 638 – Standard Test Method for Tensile Properties of Plastics.
 3. ASTM D 792 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 4. ASTM D 1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 5. ASTM D 2240 – Standard Test Method for Rubber Property—Durometer Hardness.
- E. Products, General:
 1. Model to meet wall penetration size requirements for diameter, extent and profile.

2. Refer to Drawings.
3. Plumbing: P Series
4. Tube steel: P Series
5. HVAC (Duct): P Series
6. Electrical: E Series
7. A/C piping: A/C Series

F. Plumbing Flashing Panels: (P Series)

1. Materials:
 - a. Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
 - 1) HDPE, Specific Gravity, ASTM D 1505: 0.953 g/cm³.
 - 2) HDPE, Tensile Strength at Yield, ASTM D 638: 3,100 psi.
 - 3) LDPE, Specific Gravity, ASTM D 792: 0.917 g/cm³.
 - 4) LDPE, Tensile Strength at Yield, ASTM D 638: 1,300 psi.
 - b. Weatherproof Seal: Thermoplastic elastomer.
 - 1) Hardness, ASTM D 2240, Shore A, 10 Seconds: 46.
 - 2) Specific Gravity, ASTM D 792: 1.05 g/cm³.
 - 3) Tensile Strength, ASTM D 412: 490 psi.

G. Tube Steel Flashing Panels: (P Series)

1. Materials:
 - a. Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
 - 1) HDPE, Specific Gravity, ASTM D 1505: 0.953 g/cm³.
 - 2) HDPE, Tensile Strength at Yield, ASTM D 638: 3,100 psi.
 - 3) LDPE, Specific Gravity, ASTM D 792: 0.917 g/cm³.
 - 4) LDPE, Tensile Strength at Yield, ASTM D 638: 1,300 psi.
 - b. Weatherproof Seal: Thermoplastic elastomer.
 - 1) Hardness, ASTM D 2240, Shore A, 10 Seconds: 46.
 - 2) Specific Gravity, ASTM D 792: 1.05 g/cm³.
 - 3) Tensile Strength, ASTM D 412: 490 psi.

H. HVAC Duct Flashing Panels: (P Series)

1. Materials:
 - a. Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
 - 1) HDPE, Specific Gravity, ASTM D 1505: 0.953 g/cm³.
 - 2) HDPE, Tensile Strength at Yield, ASTM D 638: 3,100 psi.
 - 3) LDPE, Specific Gravity, ASTM D 792: 0.917 g/cm³.
 - 4) LDPE, Tensile Strength at Yield, ASTM D 638: 1,300 psi.
 - b. Weatherproof Seal: Thermoplastic elastomer.
 - 1) Hardness, ASTM D 2240, Shore A, 10 Seconds: 46.
 - 2) Specific Gravity, ASTM D 792: 1.05 g/cm³.
 - 3) Tensile Strength, ASTM D 412: 490 psi.

- I. Electrical Flashing Panels:
 - 1. Material: Thermoplastic elastomer.
 - a. Hardness, ASTM D 2240, Shore A, 10 Seconds: 93.
 - b. Specific Gravity, ASTM D 792: 1.05 g/cm³.
 - c. Tensile Strength, ASTM D 412: 1,300 psi.
- J. A/C Piping Flashing Panels:
 - 1. General:
 - a. Paintable rigid exterior body.
 - b. Inside round rubber seal
 - 2. Materials:
 - a. Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
 - 1) HDPE, Specific Gravity, ASTM D 1505: 0.953 g/cm³.
 - 2) HDPE, Tensile Strength at Yield, ASTM D 638: 3,100 psi.
 - 3) LDPE, Specific Gravity, ASTM D 792: 0.917 g/cm³.
 - 4) LDPE, Tensile Strength at Yield, ASTM D 638: 1,300 psi.
 - b. Weatherproof Seal: Thermoplastic elastomer.
 - 1) Hardness, ASTM D 2240, Shore A, 10 Seconds: 46.
 - 2) Specific Gravity, ASTM D 792: 1.05 g/cm³.
 - 3) Tensile Strength, ASTM D 412: 490 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.
- C. Verify membrane termination and base flashings are in place, sealed, and secure.
- D. Beginning of installation means acceptance of existing conditions.
- E. Field measure site conditions prior to fabricating work.

3.2 PROTECTION

- A. Protect contact areas of dissimilar metals with heavy asphalt or other approved coating, specifically made to stop electrolytic action.

3.3 MANUFACTURED SHEET METAL SYSTEMS

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.
- B. Furnish and install manufactured sheet metal systems in strict accordance with manufacturer's printed instructions.
- C. Provide all factory-fabricated accessories including, but not limited to, fascia extenders, miters, scuppers, joint covers, etc

3.4 SHOP FABRICATED SHEET METAL SYSTEMS

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.
- B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.
- C. Hem exposed edges.
- D. Angle bottom edges of exposed vertical surfaces to form drip.
- E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.
- F. Joints for fascia system, cap flashing, and surface-mount counterflashing shall be formed with a 1/4" opening between sections. The opening shall be covered by a cover plate or backed by an internal drainage plate formed to the profile of fascia piece. The cover plate shall be embedded in mastic, fastened through the opening between the sections and loose locked to the drip edges.

3.5 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 -inches (50 mm).

3.6 INSTALLATION, GENERAL

- A. Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.
- D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 -feet (3 m) with no joints allowed within 24 -inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 -inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Prein edges of sheets to be soldered to a width of 1-1/2 -inches (38 mm), except where pretinned surface would show in finished Work.
 - 1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.
- G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- H. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
- I. Install reglets to receive counterflashing according to the following requirements:
 - 1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
- J. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 -inches (50 mm) and bed with sealant.
- K. Fascia: Metal fascia and copings shall be secured to wood nailers at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures
- L. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain

roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

- M. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with roofing membrane.
- N. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.
- O. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.
- P. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Seal with elastomeric sealant compatible with roof system and clamp flashing to pipes that penetrate roof.

3.7 UTILITY WALL PENETRATION FLASHING INSTALLATION

- A. Select prefabricated facility services utility penetration flashing sizes and profiles required to suit conditions.
- B. Install in accordance with manufacturer's recommendations, properly lapped with weather resistive barrier and related flashing and finishes to shed water to the building exterior.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

- END OF SECTION -

- SECTION 07 7100 -

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following manufactured roof specialties:
 - 1. Copings.
 - 2. Roof edge flashings.
 - 3. Roof edge drainage systems.
 - 4. Counter-flashings and reglets.

1.3 RELATED SECTIONS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 1053 "Miscellaneous Carpentry" for wood nailers and blocking.
- C. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing"
- D. Section 07 6200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
- E. Section 07 7200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
- F. Section 07 9200 "Joint Sealants" for field-applied sealants.
- G. Section 07 9200 "Exterior Facade Sealants" for field-applied sealants related to exterior roofing and cladding.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.5 ACTION SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes, demonstrate compliance with specified attributes.
- C. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:
 - 1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.
 - 2. Details for expansion and contraction.
- D. Samples for Initial Selection: For each type of manufactured roof specialty indicated with factory-applied color finishes.
- E. Fabrication Samples: For counterflashings and reglets made from 12-inch (300-mm) lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of opings with performance requirements.
- G. Warranty: Special warranty specified in this Section.

1.6 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: For copings and roof edge flashings indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Professional Engineer Qualifications: Demonstrate compliance with specified requirements.

1.7 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of roof specialties that are similar to those indicated for this Project in material, design, and extent.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

ROOF SPECIALTIES

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.8 COORDINATION

- A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Edge Securement: Comply with "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments. Chapter 15 and Section 1504.5 "Edge Securement for Low-Slope Roofs".
 1. Provide products designed and tested for wind resistance in accordance with ANSI/SPRI ES-1, as required by the International Building Code, Chapter 15.
- C. Delegated Design: Design copings and roof edge flashings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- D. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- E. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

2.2 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.

2.3 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
1. Surface: Smooth, flat finish.
 2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 - b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
1. Exposed High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Prepainted, Zinc-Coated Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation, structural quality, and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Surface: Smooth, flat finish.
 2. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- a. Fluoropolymer Three-Coat System: Manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605, except as modified below:
 - 1) Humidity Resistance: 2000 hours.
 - 2) Salt-Spray Resistance: 1000 hours.

2.4 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- D. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
- C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- D. Elastomeric Sealant: ASTM C 920, silicon sealant; of type, grade, class, and use classifications required to seal joints in roof specialties and trim and remain watertight, recommended by sheet metal manufacturer and fabricator of components being sealed, complying with requirements specified in Division 7 Section "Exterior Façade Sealants".
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement, complying with requirements specified in Division 7 Section "Sealants".
- F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
- H. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.

- I. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

2.6 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 -feet (3.6 m), concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end cap units.
 - 1. Provide custom profiles as shown in the drawings.
- B. Basis-of-Design Product: The design is based on PermaSnap 2 Coping system manufactured by W. P. Hickman Company, 4 Commerce Way, Arden, NC 28704, www.wph.com. Provide custom profiles to match shapes indicated.
 - 1. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
 - a. ATAS International, Inc.
 - b. Hickman, W. P. Company.
 - c. Merchant & Evans, Inc.
 - 2. Coping Caps: Snap-on, fabricated from the following exposed metal:
 - a. Extruded aluminum thickness as required to meet performance requirements
 - 3. Finish: Three-coat fluoropolymer
 - 4. Coping Cap Color: As selected by Architect from manufacturer's full range.
 - 5. Corners: Factory mitered and continuously welded watertight.
 - 6. Snap-on Coping Anchor Plates: Concealed, stainless steel sheet, 12 -inches (300 mm) wide, 0.028 -inch (0.7 mm) thick, with integral cleats.
 - 7. Face Leg Cleats: Concealed, continuous stainless steel sheet.

2.7 COUNTERFLASHINGS AND REGLETS

- A. Counterflashings: Manufactured units in lengths not exceeding 12 feet (3.6 m) designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:
 - 1. Stainless Steel: 0.025 -inch (0.64 mm) thick.
- B. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated with factory-mitered and -welded corners and junctions. Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated, from the following exposed metal in thickness indicated:
 - 1. Stainless Steel: 0.025 -inch (0.64 mm) thick.
 - 2. Type: Surface-mounted with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 - 3. Type: For stucco application, with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 - 4. Type: For concrete application with temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 - 5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

ROOF SPECIALTIES

- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Fry Reglet Corporation.
 - 2. Hickman, W. P. Company.
 - 3. Metal-Era, Inc.
- D. Accessories:
 - 1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- E. Stainless-Steel Finish: No. 4 (bright, polished directional satin).

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 - 1. Examine walls, roof edges, and parapets for suitable conditions for manufactured roof specialties.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.
 - 1. Install manufactured roof specialties with provisions for thermal and structural movement.

2. Torch cutting of manufactured roof specialties is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Coat concealed side of manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing exposed-to-view components of manufactured roof specialties directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.
- D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
- E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of **12 -feet (3.6 m)** with no unplanned joints within **18 - inches (450 mm)** of corners or intersections.
- F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than **1-1/4 inches (32 mm)** for nails and not less than **3/4 -inch (19 mm)** for wood screws.
- G. Seal joints with elastomeric sealant as required by manufacturer of roofing specialties.

3.3 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings to resist uplift and outward forces according to performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's recommended spacing.

3.4 COUNTERFLASHING AND REGLET INSTALLATION

- A. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings **4 -inches (100 mm)** over base flashings. Lap counterflashing joints a minimum of **4 -inches (100 mm)** and bed with elastomeric sealant.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

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- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

- END OF SECTION -

- SECTION 07 7200 -**ROOF ACCESSORIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Rooftop pipe and duct support devices for:
 - a. Mechanical gas piping.
 - b. Electrical conduit and raceways.
 - c. Plumbing piping, including condensate drain piping
 - d. HVAC Air Ducts
 - e. HVAC Equipment.
 - 2. Pre-manufactured Roof Curbs and Hatches
 - 3. Roof hatch railing systems / assembly.
- B. NO WOOD SLEEPERS will be allowed. Pipe supports in this Section shall be used where ever wood blocking/sleepers are indicated or where piping supports are required by code.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 1200 "Structural Steel Framing".
- C. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing" for roofing systems and conditions.
- D. Section 05 5000 "Metal Fabrications" for LadderUp Safety Post
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for required flashing at roof.
- F. Section 07 7100 "Roof Specialties"
- G. Section 08 6300 "Metal-Framed Skylights"
- H. Section 22 0529 "Hangers & Supports For Plumbing Piping & Equipment"

- I. Division 23 "HVAC" to coordinate sizes of pre-manufactured roof curbs.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Society for Testing and Materials (ASTM):
 - 1. A 123-89a Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.
 - 2. A 153-82 Zinc Coating (Hot-Dip) Steel and Iron Hardware.
 - 3. A 167-92b Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Plate.
 - 4. A 570-92 Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
 - 5. D 412-92 Rubber Tensile Strength.
 - 6. D 575 Rubber Compression and Recovery.
 - 7. D 624-91 Rubber Tear Resistance.
 - 8. D 2240-91 Rubber Property - Durometer Hardness.
 - 9. G 23-88 Rubber UV Aging
- C. Manufacture's Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
 - 1. SP-58 Pipe Hangers and Supports, Materials, Design and Manufacture, Selection, Application, and Installation.
 - a. ANSI-approved American National Standard
 - 2. SP-69 Pipe Hangers and Supports, Selection and Application.
 - a. ANSI-approved American National Standard
- D. National Roofing Contractor's Association (NRCA): NRCA Roofing and Waterproofing Manual, current edition.
- E. Sheet Metal and Air Conditioning Contractor's Association, Inc. (SMACNA): Architectural Sheet Metal Manual, current edition.

1.5 SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings for Prefabricated Curbs: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

1.6 QUALITY ASSURANCE

- A. Standards: Comply with the following:
 - 1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

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2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

- B. The Manufacturer or his representative on request will inspect the completed installation and report in writing that the design requirements meet with the Manufacturer's approval.

1.7 WARRANTY

- A. The Product Manufacturer shall provide a full system material warranty necessary to cover all cost of repairs and/or replacement of all components of the system against defects in manufacturing for the same period and duration as specified in Division 7 roofing warranty. Warrantee will not include Acts of God, vandalism, neglect, or improper spacing or installation of equipment.
- B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

1.8 PROJECT CONDITIONS

- A. Verify that other trades with related work are complete before installing roof hatch and rail system. Coordinate installation with roof membrane and roof insulation manufacturer's instructions.
- B. Refer to the Construction Documents, shop drawings, and manufacturer's installation instructions.
- C. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- D. Observe all appropriate [OSHA](#) safety guidelines for this work
- E. Coordinate layout and installation of roof accessories with interfacing and adjoining construction to provide a leak-proof, weather-tight, secure, and non-corrosive installation.
1. With [Architect's](#) approval, adjust location of roof accessories that would interrupt roof drainage routes

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 MATERIALS, GENERAL

- A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated.
 - 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 (Class AZM150) coated.
 - 3. Exposed Finishes: High-Performance Organic Finish (2-Coat Fluoropolymer): Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements in AAMA 2605, except as modified below:
 - 1) Humidity Resistance: 2000 hours.
 - 2) Salt-Spray Resistance: 2000 hours.
 - b. Color and Gloss: As selected by Architect from manufacturer's full range
- B. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 -inches thick.
- D. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
 - 1. Where removing exterior exposed fasteners affords access to building, provide nonremovable fastener heads.
- E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- F. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coating.
- G. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- H. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.
- I. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.3 ROOF CURBS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Roof Curbs:
 - a. Roof Products & Systems Corp.
 - b. ThyCurb, Inc.
- B. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
- C. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum **0.0747-inch** thick (14 gage), structural-quality, hot-dip galvanized steel sheet; factory primed and prepared for painting with corner joints mitered and fully welded.
1. Shop prime welded connections with zinc-rich paint complying with SSPC-Paint 20.
 2. Structurally reinforce curb sections **24 -inches** o.c. at bulkheads.
 3. Provide preservative-treated wood nailers at tops of curbs.
 - a. Nailer for roof curb shall be nominal **2 -inch** by **2 -inch**.
 - b. Nailer for equipment support curb shall be nominal **2 -inch** by **4 -inch** or other width as required.
 4. Provide manufacturer's standard rigid or semirigid insulation where indicated.
 5. Fabricate units to typical height of **9 -inches**, as measured from top of roof membrane to top of curb, unless otherwise indicated.
 6. Sloping Roofs: Where slope of roof deck exceeds **1/4 -inch** per **foot**, fabricate curb units with height tapered to match slope to level tops of units.
 7. Curb models for this Project include, but are not limited to, the following Custom Curb designations:
 - a. Typical roof curb: CRC-3
 - b. Equipment support curb: CES-3
 - c. Platform curbs: CPF-3
 - d. Pipe accessories: Vertical pipe curb, pipe box and roller support.

2.4 PIPE CURBS AND SUPPORTS

- A. Manufacturer:
1. Basis of Design: The support system shall be manufactured by RoofTop Accessories located in Tomball, TX. tel: (866) 536-5506, web: www.keycurb.com, or similar manufactured product manufactured with 100 percent molded recycled rubber curbs.
- B. Curb: Molded **100 percent** recycled rubber.
1. Dimensions: **3 1/2 -inches** high **6 -inches** wide **9 -inches** in length.
 2. Composition: Recycled Rubber; **100 percent** binder.
 3. Curb Supports Thickness: **4 -inches**.
 4. Curb Support Weight: **8.0 lbs./lf.**
 5. Color: Black

- C. Frame: Pre-Galvanized Zinc coated 14 Gage channel (ASTM. A653).
- D. Hangers: Clevis and/or band type as per pipe requirements.
- E. Accessories: Cadmium plated threaded rods, clamps, nuts, bolts and washers.
- F. Rollers: Non Binding Heavy Duty Plastic.
- G. Pipe Supports:
 - 1. Manufacturer must supply Vibration Isolation and Cushion system with minimum shock transmission to the substrate, allowing free movement, no pipe tension or binding.
- H. Curb: Molded Recycled Rubber
 - 1. Type: KeyCurb, Model (KC9) Pipe curb.
 - a. Curb dimensions are 3 1/2 -inches high 6 -inches wide 9 -inches long.
 - b. Curb is to be used in the place of wood blocking for conduit supports.
 - 2. Type: KeyCurb Strut, Model (KS)
 - a. Designed to support piping up to 8 -inches in diameter.
 - b. Curb is to be used with strut clamps. Curb is a Model KC with a framing channel.
 - 3. Type: KeyCurb Strut Adjustable, Model (KSA)
 - a. Designed to support piping up to 8 inches in diameter.
 - b. Curb is to be used with strut clamps. Curb is a Model KC with a framing channel and adjustable with threaded rods.
 - 4. Type: KeyCurb Roller, Model (KR4)
 - a. Designed to support piping up to 4 -inches in diameter.
 - b. Curb is a Model KCM with heavy duty rubber roller.
 - c. Roller support will be used with water or gas piping for low profile pipe.
 - 5. Type: KeyCurb Roller Adjustable, Model (KRA4).
 - a. Designed to support piping up to 4 -inches in diameter.
 - b. Curb is a Model KC with heavy duty rubber roller, adjustable with threaded rods.
 - c. Roller support will be used with water or gas piping.
 - 6. Type: KeyCurb Bridge, Model (KCB)
 - a. Designed to support all type of piping.
 - b. Curb is to be used with strut clamps or roller accessories.
 - c. Model KCB consists of two KeyCurbs and framing channel.
 - 7. Type: KeyCurb Bridge Adjustable, Model (KCBA).
 - a. Designed to support all types of piping.
 - b. Curb is to be used with strut clamps or roller accessories.
 - c. Model KCBA consists of two KeyCurbs, framing channel, and four threaded rods.
 - 8. Type: KeyCurb Adjustable Bridge, Model (ASB).
 - a. Designed to support piping up to 12 -inches.
 - b. Four (4) KeyCurb Model KC9 with steel clevis and / or swivel hangers, adjustable with threaded rods.
 - c. Hanger support will be used with water or gas piping.
 - 9. Type: KeyCurb Adjustable Support Model (AS).

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- a. Designed to support piping and a/c ducts.
- b. Two (2) KeyCurbs Model KS with cross bar to suspend hangers or adjustable rollers placed on top of cross bar.

I. Physical Properties:

1.	Tensile Strength	350 psi	ASTM D412
2.	Hardness	53 Shore A	ASTM D2240
3.	Flammability	Meets Federal Flammability Doc FF 1-70 CPSC	
4.	Flame Spread	0.495"/Min on 3/4-inch thick mat	UL 94, (HB test)
5.	Dimensional Stability	+0.242% at two hours @ 60C-0.092% at 48 hours @ 20C & 65% Relative Humidity	
6.	Ultimate Elongation	152%	ASTM D412
7.	Critical Radiant Flux	0.11 watts/sq.cm. 1.6 x 10 9 megohms average	ASTM E648
8.	Electrical Resistance	5.6 x 10 8 megohms average	ASTM D991
9.	Electrostatic Propensity	Neg 0.9 KV Max. Voltage	AATCC Test Method 134-1991
10.	Thermal Resistance	0.36 per 1/2-inch	R-Value
11.	Tear Resistance (ppi)	122 lbs./in.	ASTM D624
12.	Coefficient of Friction	.096	ASTM D1894
13.	UV Aging	No Cracks/Deterioration	ASTM G23

J. Accessories

- 1. Isolation Pads are not required with molded recycled rubber curbs.
- 2. Pad or slip sheet shall conform to the existing roof manufacturers system if required.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the air-dried primer specified below immediately after cleaning and pretreating.
1. Shop Primer: Exterior galvanized metal primer per Division 9 Section "Exterior Painting."

2.7 ACCESSORIES

- A. Elastomeric Sealant: ASTM C 920, silicon sealant; of type, grade, class, and use classifications required to seal joints in roof specialties and trim and remain watertight, recommended by sheet metal manufacturer and fabricator of components being sealed, complying with requirements specified in Division 7 Section "Exterior Façade Sealants".
- B. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement, complying with requirements specified in Division 7 Section "Exterior Façade Sealants".

2.8 ROOF HATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. [The Bilco Company](#) (203-934-6363)
 - b. [Milcor, Inc.](#), a brand of Commercial Products Group of Hart & Cooley, Inc. (800-624-8642)
 - c. [O'Keeffe's, Inc.](#) (888-653-3333)
 - d. [Nystrom Building Products, Inc.](#) (800-547-2635)
 - e. Approved Substitution.

- B. Product:
 - 1. Size:
 - a. 2-feet -6-inch by 3 -feet size, single leaf type, **Model "S-50"**
 - 2. Conforming to UL 790, Class A
 - 3. Ladder Assist "LadderUp" Safety Post:
 - a. Refer to Section 05 5000 "Metal Fabrications"
- C. Curb: 12 -inch height, 11 gauge aluminum, mill finish, with one inch rigid insulation; integral cap flashing to receive roof flashing system; extended flange for mounting.
- D. Cover: 11 gauge aluminum with one inch glass fiber insulation retained by 18 gauge inner liner. Continuous gasket to provide weatherproof seal.
- E. Hardware: Manufacturer's standard manually operated type with compression spring operators, positive snap latch with turn handles inside and out and padlock hasp inside; automatic hold-open arm with vinyl covered grip handle for easy release, cadmium plated finish.
- F. Hinges: Manufacturer's recommended type.
- G. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.

2.9 HATCH RAIL SYSTEM

- A. Furnish and install where indicated on plans hatch rail system Model RL-S as manufactured by Bilco Co. or approved Substitution. The hatch rail system shall be field assembled and installed per the manufacturer's instructions.
- B. Performance characteristics:
 - 1. High visibility safety yellow color shall be molded in.
 - 2. Hatch rail system shall attach to the capflashing of the roof hatch and shall not penetrate any roofing material.
 - 3. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.23 and shall meet OSHA strength requirements with a factor of safety of two.
 - 4. UV and corrosion resistant construction with a twenty-five year warranty.
 - 5. Self-closing gate shall be provided with hatch rail system.
- C. Posts and Rails: Shall be round pultruded reinforced fire retardant yellow fiberglass treated with a UV inhibitor.
- D. Hardware: Mounting brackets shall be 1/4 -inch thick hot dip galvanized steel. Hinges and post guides shall be 6063T5 aluminum. Fasteners shall be Type 316 stainless steel.

2.10 ACCESSORIES

- A. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 -inch thick.
- B. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

- C. Where removing exterior exposed fasteners affords access to building, provide nonremoveable fastener heads.
- D. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.
- B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,
- C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
- D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counter-flashing). Seal overlap with thick bead of mastic sealant.
- F. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 PIPE SUPPORTS

- A. Field customize to fit existing condition or as specified herein.
- B. Set bases and support framing in locations specified or required herein as per drawings and site conditions but not to exceed 10' spacing. No Isolation pads are required under the support curbs. Sweep any loose gravel before setting supports, apply slip sheet or pad if required by roofing manufacturer.
- C. Adjust all frame structures to required height and weight, assemble framing, supports, and hangers to configuration indicated.
- D. Adjust each required hanger, roller or clamp to its desired height, check each support for equal weight disbursement.

3.3 CLEANING AND PROTECTION

- A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

- END OF SECTION -

- SECTION 07 7600 -**ROOF AND PODIUM PAVERS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Pavers for pedestrian traffic, on pedestals, over waterproofing membrane at Pool Room.
- B. Provide paver system over waterproofing membrane that will work in concert with waterproofing system. The installation of the paver system shall not damage and or compromise in any other way the waterproofing system. Do not begin installation of paver system until waterproofing system is fully complete and has successfully passed water testing requirements.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 8113 "Sustainable Design Requirements".
- C. Section 07 1813 "Pedestrian Traffic Coatings" for waterproofing membrane below pedestals and pavers.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- C. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
- D. ASTM D 471 - Standard Test Method for Rubber Property-Effect of Liquids.
- E. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

- F. ASTM D 746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
- G. ASTM D 1525 - Standard Test Method for Vicat Softening Temperature of Plastics.
- H. ASTM D 1706 - Method of Test for Indentation Hardness of Plastics.

1.5 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Catalog Data: Manufacturer's data sheets on each product to be used, including material properties, and storage and handling requirements and recommendations.
 - 2. Installation Instructions : Manufacturer installation techniques.
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Shop Drawings: Submit showing all components required for the paver installation requirements. Shop drawings shall include:
 - 1. Plan drawings showing layout of all paver areas including patterns and terminations.
 - 2. Detail drawings showing how various components of the systems fit together. Include manufacturer's literature completely describing all components of the paver systems and giving detailed installation recommendations and instructions.
 - 3. Detailed installation drawings for all precast unit.
- E. Samples for Verification:
 - 1. Two paver samples, minimum size 12 inches square, representing actual product to be supplied showing color, patterns, etc.
 - 2. Pedestal system components, one each.

1.6 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer shall have completed a minimum of 50 roofing squares of paver system in the Southwest US. To qualify for this requirement, the completed paver system must have met all conditions to obtain material and labor warranty.

2. Installer shall supply a list of projects, completed in the Southwest US, where the specified paver system has been in place and performing successfully for a period of not less than 5 years.

- B. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Store products off the ground. If stored on building floor, do not exceed its structural capacity.

1.9 WARRANTY

- A. Pavers: Provide manufacturer's 10-year limited material warranty.
- B. Pedestals: Provide pedestal manufacturer's 3-year warranty.

1.10 MAINTENANCE TOOLS

- A. Paver Lifter: Provide one Wausau Big Blok Handle paver lifter. Deliver to owner as part of close-out items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers, primers, and coatings. Comply with limits specified in Section 01 6116.

2.2 PAVERS

- A. Acceptable Manufacturer: Wausau Tile, Wausau, WI; tel: (800) 388-8728; email: wtile@wausautile.com ; web: www.wausautile.com .
 1. Substitutions: Section 01 2500.
- B. Pressed Concrete Pavers, Pedestal Supported **ST-9**: Stoney Creek Pavers by Wausau.
 1. Nominal Size: 24 inches x 48 inches (610 mm x 1219 mm).
 2. Thickness: 2 inches to 2-3/4 inches (51 mm to 70mm).
 3. Weight: 24 pounds to 33 pounds per square foot depending on thickness.
 4. Compressive Strength: ≥8000 psi, when tested in accordance with ASTM C140.
 5. Water Absorption: <6 percent when tested in accordance with ASTM C 140.
 6. Freeze-Thaw Resistance: ≤1 percent loss of dry weight, when tested in accordance with ASTM 1262.
 7. Center Load: 1850 lbs when tested in accordance with WTCL 99.
 8. Color: SC-10.

2.3 PAVER PEDESTALS

- A. Acceptable Manufacturer: Wausau Tile, Wausau, WI; tel: (800) 388-8728; email: wtile@wausautil.com; web: www.wausautil.com.
1. Substitutions: Section 01 2500.
- B. Paver Pedestal System: Provide complete system comprised of manufacturer's components required to meet pedestal design as detailed on Drawings.
1. Terra-Stand Pedestals: Accommodates various pitches and height changes of the project area.
- a. Unit Material: High-impact copolymer polypropylene.
 - b. Unit Outside Dimension: 7 inches.
 - c. Height Adjustment: 2-1/2 inches minimum to 21 inches maximum.
 - d. Slope Adjustment: Up to 5/8 inch tilt.
 - e. Terra-Tabs are used on top of this unit.
2. Terr-Adjust Adjustable Pedestals: Accommodates various pitches and slopes of the project area.
- a. Unit Material: High-impact styrene.
 - b. Unit Outside Diameter: 6-1/8 inches.
 - c. Height Adjustment: Telescoping from 2 inches minimum to 5-1/2 inches maximum.
 - d. Slope Adjustment: Tilt to level plane.
 - e. Terra-Tabs are used on top of this unit.
3. Terra-Tabs and Shim Plates:
- a. Terra-Tabs: Provides spacing tabs allowing for drainage, air circulation and resiliency without sound transmission.
 - 1) Unit Material: SBR rubber.
 - 2) Size: Corresponding to various paver sizes.
 - 3) Thickness: 1/8 inch or 3/16 inch.
 - 4) Shore Hardness: 70.
 - b. Terra-Shim Plates:
 - 1) Unit Material: SBR rubber.
 - 2) Size: Corresponding to various Terra-Tab sizes.
 - 3) Thickness: 1/8 inch or 1/4 inch.
4. Spacer Unit: Accommodates 1/8 inch or 3/16 inch spacing.
5. Terr-Adjust Extenders/Reducers: Units to be used in areas requiring under 2 inches or over 5-1/2 inches in height.
- a. Extender: Provides additional 4 inches adjustment to a maximum height of 10 inches.
 - 1) Unit Material: High-impact styrene.
 - 2) Terra-Tab or Terra-Shim Plates with spacer unit are used on top of this unit.
 - b. Reducer: Accommodates height adjustment between 1/2 inch and 2 inches.
 - 1) Unit Material: High-impact styrene.
 - 2) Terra-Tab or Terra-Shim Plates with spacer unit are used on top of this unit.

6. Waffle Reducer: Unit consists of one base with 3/8 inch thick and/or 3/4 inch thick waffle rings.
 - a. Unit Material: High-impact copolymer polypropelene.
 - b. Unit Outside Diameter: 6 inches.
 - c. Height Adjustment: 1/2 inch minimum to 2 inches maximum.

2.4 ACCESSORIES

- A. Installation Handles:
 1. Big Blok Handle: Unit to handle paver dimensions 24 inches to 36 inches nominal, allowing installing contractor to set units into proper location with 3/16 inch or 1/8 inch joint between units.
 - a. Also allows for removal and reinstallation without causing damage to unit or adjacent units, thus allowing inspection of utilities or drains at any time.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until waterproofing work is completed, including work penetrating waterproof plane.
- B. Inspect deck and fixed elevation locations. All height or location problems to be corrected prior to installation.
- C. Compare layout of room to shop drawings. All variances of field conditions to drawings to be reviewed and corrected prior to starting installation.
- D. Correct any drainage deficiencies prior to commencement.
- E. Proceeding with construction constitutes acceptance of existing conditions by Contractor.

3.2 PREPARATION

- A. Clean substrate surfaces thoroughly prior to installation.
- B. Plan sequence of transporting and placing pavers to avoid damage to waterproof membrane and already installed pavers; place 3/4-inch thick plywood or other protection material in traffic paths or use carts with pneumatic tires.

3.3 INSTALLATION OF PAVERS

- A. Install pavers on pedestals per manufacturer's instructions.
- B. Install pavers over waterproofing surface as indicated on Drawings.
- C. Install pavers in pattern as indicated on Drawings.

- D. Do not cut pavers unnecessarily; if less than full size pavers will be required, locate less than full size pavers at least conspicuous edges or balance cuts equally between parallel building walls.
- E. Install pavers with top surface flat with minimal difference in height between adjacent pavers; accommodate varying heights due to slope by using adjustable height pedestals; use a reliable method of determining levels.
- F. When pavers must be cut, use mason's saw; do not chip or split; remove dust generated by cutting immediately using high-pressure water or air to avoid discoloration of pavers.

3.4 TOLERANCES

- A. Maximum of 1/16 inch height variation between adjacent pavers.
- B. Individual pavers shall not vary more than 1/16 inch from level across width of the paver.
- C. Paver areas shall not vary more than 1/4 inch from level in a distance of 10 feet measured at any location and in any direction.
- D. Joints between pavers to be 1/8 inch or 3/16 inch.

3.5 PROTECTION

- A. Protect installed products until completion of project. Prohibit construction traffic unless adequate precautions are taken.
- B. Repair or replace products damaged due to inadequate protection.

- END OF SECTION -

- SECTION 07 8100 -**APPLIED FIREPROOFING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Concealed cementitious sprayed fire-resistive materials.
 - 2. Topcoats.
 - 3. Sealers.
 - 4. Intumescent fire resistive coatings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 05 1200 "Structural Steel Framing" for surface conditions required for structural steel receiving sprayed fire-resistive materials.
- D. Section 05 3100 "Steel Decking".
- E. Section 07 2100 "Thermal Insulation" for fire-safing insulation.
- F. Section 07 8413 "Penetration Firestopping" for fire-resistance-rated firestopping systems.
- G. Section 07 8446 "Fire-Resistive Joint Systems" for fire-resistance-rated joint systems.
- H. Section 09 2900 "Gypsum Board" for gypsum-board-based fire protection.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Concealed Sprayed Fire-Resistive Materials: Applied to surfaces that are concealed from view behind other construction when the Work is completed.
- B. Exposed Sprayed Fire-Resistive Materials: Applied to surfaces that are exposed to view when the Work is completed and surfaces that are accessible through acoustical panel ceilings and surfaces that are accessible through acoustical tile ceilings.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Shop Drawings: Structural framing plans indicating the following:
 - 1. Locations and types of surface preparations required before applying sprayed and Intumescent fire-resistive material.
 - 2. Extent of sprayed and Intumescent fire-resistive material for each construction and fire-resistance rating, including the following:
 - a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
 - c. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3 as determined by a qualified professional engineer.
 - 3. Treatment of sprayed and Intumescent fire-resistive material after application.
- F. Samples for Verification: For each type of colored, exposed sprayed and intumescent fire-resistive material, two Samples, each 4 inches (102 mm) square, of each color, texture, and material formulation to be applied. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of sprayed fire-resistive material, signed by product manufacturer.
- B. Qualification Data: For Installer and manufacturer.
- C. Compatibility and Adhesion Test Reports: From sprayed fire-resistive material manufacturer indicating the following:
 - 1. Materials have been tested for bond with substrates.
 - 2. Materials have been verified by sprayed fire-resistive material manufacturer to be compatible with substrate primers and coatings.
 - 3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed sprayed fire-resistive materials.
- E. Research/Evaluation Reports: For sprayed fire-resistive materials.
- F. Warranties: Special warranties specified in this Section.

1.8 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual certified, licensed, or otherwise qualified by fire-resistive material manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.
 - 1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility for designation of restrained and unrestrained conditions.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain sprayed fire-resistive materials through one source from a single manufacturer.
- D. Fire-Resistive Materials Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.
 - 1. Fire-resistive materials are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Testing is performed on specimens of fire-resistive materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.

3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
- E. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.
 1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with sprayed fire-resistive material.
- F. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing sprayed fire-resistive materials with appropriate markings of applicable testing and inspecting agency.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for sprayed fire-resistive material serving as direct-applied protection tested per ASTM E 119.
 2. Surface-Burning Characteristics: ASTM E 84.
- G. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to sprayed fire-resistive materials including, but not limited to, the following:
 1. Review and finalize construction schedule and verify sequencing and coordination requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.
- C. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
- D. Store materials inside, under cover, aboveground, and kept dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperature is 40 deg F (4 deg C) or lower unless temporary protection and heat is

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provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

- B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.11 COORDINATION

- A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:
1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
 5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
 6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
 7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
 8. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace sprayed fire-resistive materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of sprayed fire-resistive materials from substrates.
 2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
- B. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

2.3 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. Asbestos: Provide products containing no detectable asbestos.

2.4 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

- A. General: For concealed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and physical properties representative of installed products.
- B. Available Products:
 - 1. Cementitious Sprayed Fire-Resistive Material:
 - a. Carbolite Co., Fireproofing Products Div.; SOUTHWEST TYPE 7HD™.
 - b. Tested in accordance with ASTM E119/UL 263 at Underwriter's Laboratories, Inc. and listed by UL in the following designs: Protected Floor/Ceiling: D739, D788 (Restrained/Unrestrained)
 - 1) Additional designs: A702, D701, D703, D704, D705,
 - 2) D706, D708, D709, D710, D711, D712, D715, D716,
 - 3) D722, D723, D725, D726, D727, D728, D729, D730,
 - 4) D740, D742, D743, D744, D745, D746, D747, D748,

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5) D750.

C. Material Composition:

1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
2. Sprayed-fiber fire-resistive material consisting of factory-mixed, dry formulation of inorganic binders, mineral fibers, fillers, and additives conveyed in a dry state by pneumatic equipment and mixed with water at spray nozzle to form a damp, as-applied product.

D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. (240 kg/cu. m) for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWC Technical Manual 12-A, Section 5.4.5, "Displacement Method."
2. Thickness: Provide minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch (9 mm), per ASTM E 605:
 - a. Where the referenced fire-resistance design lists a thickness of 1 inch (25 mm) or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch (6 mm).
 - b. Where the referenced fire-resistance design lists a thickness of less than 1 inch (25 mm) but more than 0.375 inch (9 mm), the minimum allowable individual thickness of sprayed fire-resistive material is the greater of 0.375 inch (9 mm) or 75 percent of the design thickness.
 - c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft. (240 kg/cu. m).
3. Bond Strength: 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736 under the following conditions:
 - a. Field test sprayed fire-resistive material that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
 - b. If surfaces of structural steel receiving sprayed fire-resistive material are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736.
 - c. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch (19 mm).
4. Compressive Strength: 5.21 lbf/sq. in. (35.9 kPa) as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch (19 mm) and minimum dry density shall be as specified, but not less than 15 lb/cu. ft. (240 kg/cu. m).
5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
6. Deflection: No cracking, spalling, or delamination per ASTM E 759.

7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 0.
10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

2.5 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
 1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory," for coating materials based on a series of bond tests per ASTM E 736.
 2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of sprayed fire-resistive material per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fire-resistive material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.
- E. Reinforcing Fabric: Glass-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated, approved by manufacturer of intumescent mastic coating fire-resistive material.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance designs indicated, approved by manufacturer of intumescent mastic coating fire-resistive material. Include pins and attachment.
- G. Sealer for Sprayed-Fiber Fire-Resistive Material: Transparent-drying, water-dispersible protective coating recommended in writing by manufacturer of sprayed-fiber fire-resistive material.
 1. Product: Subject to compliance with requirements, provide "Cafco Bond-Seal" by Isolatak International Corp.; Cafco Products.

- H. Topcoat: Type recommended in writing by manufacturer of each sprayed fire-resistive material for application over concealed and exposed sprayed fire-resistive materials.
- I. Cement-Based Topcoat: Factory-mixed, cementitious hardcoat formulation recommended in writing by manufacturer of sprayed fire-resistive materials for trowel or spray application over concealed and exposed sprayed fire-resistive materials.
 - 1. Product: Subject to compliance with requirements, provide "Cafco 800" by Isolatek International Corp.; Cafco Products.

2.6 INTUMESCENT MASTIC FIRE-RESISTIVE COATINGS

- A. Products:
 - 1. Fire-Resistive, Water-Based Intumescent Mastic Coating Material:
 - a. A/D Fire Protection Systems Inc.; Firefilm II and Colorcoat.
 - b. Albi Manufacturing, Division of StanChem Inc.; Albi Clad TF.
 - c. Carboline Co., Fireproofing Products Div.; Nullifire S607 and Topseal.
 - d. Isolatek International Corp., Cafco Products; Cafco SprayFilm-WB II Basecoat and Topseal.
 - e. Isolatek International Corp., Cafco Products; Cafco SprayFilm-WB III Basecoat and Topseal.
 - 2. Substitutions: Section 01 2500.
- B. Primer: Intumescent paint manufacturer's recommended primer compatible with substrate and other materials indicated.
- C. Thin-Film Fire-Resistive Intumescent Mastic Coating: Factory-mixed formulation.
 - 1. Water-Based Formulation: Approved by manufacturer and authorities having jurisdiction for interior use.
 - 2. Non-Water-Based Formulation: Approved by manufacturer and UL or another testing and inspecting agency acceptable to authorities having jurisdiction for exterior use.
 - 3. Multicomponent system consisting of intumescent base coat and topcoat.
- D. Color and Gloss: As indicated by manufacturer's designations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
 - 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
 - 2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.

3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, loose mill scale, and incompatible primers, paints, and encapsulants.
- C. Prime substrates where recommended in writing by sprayed fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive sprayed fire-resistive material.
- D. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 INSTALLATION, GENERAL

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply sprayed fire-resistive material that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.
- D. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by sprayed fire-resistive material manufacturer for material and application indicated.

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- E. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by sprayed fire-resistive material manufacturer, install body of fire-resistive covering in a single course.
- F. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by sprayed fire-resistive material manufacturer.
- G. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply sprayed fire-resistive material that differs in color from that of encapsulant over which it is applied.
- H. Where sealers are used, apply products that are tinted to differentiate them from sprayed fire-resistive material over which they are applied.

3.4 INSTALLATION, CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

- A. Apply concealed sprayed fire-resistive material in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed Sprayed Fire-Resistive Materials" Article.
- B. Apply water overspray to concealed sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating.
- C. Apply sealer to concealed sprayed fire-resistive material.
- D. Apply topcoat to concealed sprayed fire-resistive material.
- E. Apply thin-film intumescent mastic fire-resistive coating as follows:
 - 1. Finish: Spray apply successive base coat(s) and finish topcoat. Allow to dry and cure between coats. Before applying finish topcoat, determine required dry film thickness according to manufacturer's written recommendations.
 - 2. Finish: Spray application with surface lightly rolled before drying to smooth out surface irregularities and to seal in surface fibers.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: County qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of completed applications of sprayed fire-resistive material shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of sprayed fire-resistive material for the next area until test results for previously completed applications of sprayed fire-resistive material show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
 - 1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. (93-sq. m) area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in.

- (0.093-sq. m) sample area, with sample width of not less than 6 inches (152 mm) per ASTM E 605.
2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
 3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWC Technical Manual 12-A, Section 5.4.5, "Displacement Method."
 4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. (929 sq. m) area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.
 5. If testing finds applications of sprayed fire-resistive material are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
- C. Remove and replace applications of sprayed fire-resistive material where test results indicate that it does not comply with specified requirements for cohesion and adhesion, for density, or for both.
- D. Apply additional sprayed fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect sprayed fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- C. Coordinate application of sprayed fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistive material and patch any damaged or removed areas.
- D. Repair or replace work that has not been successfully protected.

- END OF SECTION -

- SECTION 07 8413 -**PENETRATION FIRESTOPPING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes:
 - 1. Through-penetration firestopping in fire rated construction for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
 - 2. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions
 - 3. Through-penetration smoke-stopping in smoke partitions.
 - 4. Openings and penetrations in fire-rated partitions or walls containing fire doors.
 - 5. Openings around structural members which penetrate floors or walls.
 - 6. Construction-gap firestopping at connections of the same or different materials in fire rated construction.
 - 7. Construction-gap firestopping occurring within fire-rated wall, floor or floor-ceiling assemblies.
 - 8. Construction-gap firestopping occurring at the top of fire rated walls.
 - 9. Marking and Identification of Fire Walls, Fire Barriers, Fire Partitions, Smoke Barriers, and Smoke Partitions.
- B. Refer to drawings for specific penetration assemblies

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- D. Section 03 3000 "Cast-In-Place Concrete".

- E. Section 04 2000 "Concrete Unit Masonry".
- F. Section 07 2100 "Thermal Insulation" for fire safing insulation.
- G. Section 07 8446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
- H. Section 09 2216.23 "Gypsum Board Shaft-Wall Assemblies".
- I. Section 09 2900 "Gypsum Board".
- J. Division 21 "Fire Suppression".
- K. Division 22 "Plumbing".
- L. Division 23 "Heating, Ventilating, and Air Conditioning".
- M. Division 26 "Electrical".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Society for Testing and Materials Standards, www.astm.org
 - 1. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - 2. ASTM E 814 Standard Test Method for Fire Tests of Through-Penetration Firestops.
 - 3. ASTM E 1399 Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
 - 4. ASTM E 2174 Standard Practice for On-site Inspection of Installed Fire Stops.
 - 5. ASTM E2837 for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies
- C. Arizona State Fire Marshal listings.
- D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.
- E. National Fire Protection Association, www.nfpa.org
 - 1. NFPA 101 - Life Safety Code
 - 2. NFPA 70 - National Electric Code
- F. Underwriters Laboratories, www.ul.com
 - 1. U.L. (FRD) Fire Resistance Directory
 - a. Firestop Devices (XHJI)
 - b. Fire Resistance Ratings (BXRH)
 - c. Through-Penetration Firestop Systems (XHEZ)
 - d. Fill, Voids, or Cavity Material (XHHW)

PENETRATION FIRESTOPPING

- e. Forming Material (XHKU)
- f. Through-Penetration Firestop Devices (XHCR)
- g. Fire Resistance Ratings (BXUV)
- h. Fill, Void, or Cavity Material (XHHW)
- i. Continuity Head-of-wall Joint Systems (XHBO)
 - 1) Refer to Section 07 8446 "Fire-Resistive Joint Systems"

- 2. U.L. 1479 Test Method for Fire Tests of Through-Penetration Firestop systems, including optional air leak test.
- 3. U.L. 2079 Tests for Fire Resistance of Building Joint systems, including testing of; expansion, wall tops and construction joints.
- 4. U.L. Component Listing Test Criteria
- 5. Warnock Hersey

1.5 DEFINITIONS

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time rated fire walls, smoke barrier walls, time rated ceiling/floor assemblies and structural floors.
- C. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. Construction gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.
- F. System: Specific products and applications classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.
- G. Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other Sections and may or may not be required.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified firestop systems to be used and manufacturer's

- installation instructions to comply with Section 01 3300 "Submittal And Substitution Procedures".
2. Manufacturer's engineering judgment identification number and drawing details when no qualified tested system is available for an application.
 - a. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.
- D. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- F. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.
- D. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
- E. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
- F. Closeout Submittals:
 1. Submit under provisions of Section 01 7700.
 2. Warranty: Submit specified warranty.

PENETRATION FIRESTOPPING

1.8 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 2. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
 3. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least **0.01 -inch** of water is maintained at a distance of **0.78 -inch** below the fill materials surrounding the penetrating items in the test assembly.
 4. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 5. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
 6. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least **0.01 -inch** of water, as measured **0.78 -inch** from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Information on drawings referring to specific Design Designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation.
1. Any changes in conditions and designated systems require the Architect's prior approval.
 2. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.
- C. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

1.9 INSTALLER QUALIFICATIONS

- A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
 - 1. Prior to installing fire stop assemblies, the installer shall furnish the Architect with written proof of qualification from the manufacturer of the fire stop material, certifying that the installer has satisfactorily completed technical and installation training for the specified products.
 - 2. The manufacturer of the fire stop material shall, at no cost to the Owner or the Architect, provide sufficient inspections of installed systems to assure that all criteria required by the Project and by code are accomplished to the minimum standards shown in each UL system installed. The requirements of these Paragraphs are in addition to any requirement and/or field inspection requirements requested by the local authority having jurisdiction.
 - 3. The work is to be installed by a contractor with at least one of the following qualifications:
 - a. FCIA Member Specialty Firestop Contractor, FM 4991 Approved and inspected to meet ASTM E2174/2393 Protocol
 - b. UL Approved Contractor
 - c. Product manufacturers approved installer
 - 4. Firm with not less than three (3) years experience with fire stop installation.
- B. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic.
 - 1. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- C. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.
- D. Preinstallation Conference: Conduct conference at Project site .

1.10 MANUFACTURER QUALIFICATIONS

- A. Single Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
 - 1. Single manufacturer for all penetrations requiring firestopping.
- B. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation.
 - 1. Engineering judgment documents by product manufacturer must follow requirements set forth by the International Firestop Council.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.

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- B. Deliver firestopping products to Project site undamaged in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.
- C. Store materials under cover and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- D. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- E. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- F. Do not use damaged or expired materials.

1.12 PROJECT CONDITIONS

- A. Do not use materials that contain flammable solvents.
- B. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- C. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.
- D. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.
- E. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
- F. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- G. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

1.13 SEQUENCING AND SCHEDULING

- A. Notify Owner's inspection agency at least 1 week in advance of firestopping installations; confirm dates and times on days preceding each series of installations.
- B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

1.14 COORDINATION

- A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems.
 - 1. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.
- D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.
- E. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- D. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- E. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas.
- F. L-Rated Through-Penetration Firestop Systems: The L Rating measures the amount of air that moves through an opening in cubic feet per minute per square foot of opening area, at ambient temperatures and 400F.
 - 1. The two temperature levels simulate cold and hot smoke moving in a building.
 - 2. Ratings are stated as cfm/sf, and are stated right below the F and T Ratings.
 - 3. An acceptable amount of air movement for a complete wall assembly has been established by NFPA 101 as .75 cfm/sf opening area.
 - 4. Many firestop systems have L Ratings of less than one.

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- G. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- H. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
- I. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.
- J. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
- K. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- L. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- M. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation.
 - 1. Engineering judgment documents by product manufacturer must follow requirements set forth by the International Firestop Council.

2.2 FIRESTOPPING, GENERAL

- A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- B. Provide components for each firestopping system that are needed to install fill material.
 - 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
 - 2. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials
- C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.
- D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - 2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

- E. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
- F. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.
- G. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.
- H. Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.3 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide single source products by one of the following;

- 1. Hilti, Inc., www.hilti.com
- 2. 3M Fire Protection Products, 3M.com/Firestop
- 3. STI, Specified Technologies Inc., www.stifirestop.com

2.4 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01 -inch wg (2.49 Pa).
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

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1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.5 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

1. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.
- K. Safing: Mineral wool insulation at intersection of floor slabs and exterior walls and at intersection of fire-rated partitions and slabs above.
 1. Specified in Section 07 2100 "Thermal Insulation".

2.6 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.7 FIRESTOPPING ASSEMBLY MATERIALS

- A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors and/or gypsum walls, the following products are acceptable:
 1. Hilti:
 - a. (CP 681) Tub Box Kit - for use with tub installations.
 - b. (CP 653) Speed Sleeve - for use with cable penetrations.
 - c. (CFS-DID) Firestop Drop-In Device - for use with noncombustible and combustible penetrants.
 - d. (CFS-BL) Firestop Block
 - e. (CP 680-P) Cast-In Place Firestop Device
 - 1) Add Aerator Adaptor when used in conjunction with aerator system.
 - f. (CP 680-M) Cast-In Place Firestop Device -for use with noncombustible penetrants.
 2. 3M:
 - a. Cast-In Device for Metal pipes or cables:
 - 1) 2MCID
 - 2) 3MCID
 - 3) 4MCID

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- 4) 6MCID
 - b. Cast-In Device for Plastic pipes
 - 1) 2PCID
 - 2) 3PCID
 - 3) 4PCID
 - 4) 6PCID
 - c. Fire Barrier Pass Through devices, Square or Round, for use with Cable Bundles
 - d. Fire Barrier Pass Through Putty Sleeve Kits
 - 3. STI:
 - a. Series Cast-in Place Devices for metal and plastic pipes;
 - 1) CD200 2 –inch diameter
 - 2) CD300 3 –inch diameter
 - 3) CD400 4 –inch diameter
 - 4) CD600 6 –inch diameter
 - 5) CD200T Tub Adapter
 - 6) EZ Path 33 and 44 Series Devices for Cabling in Cores or Block Outs
 - a) EZDP133FK
 - b) EZDP144FKS
 - c) EZDG444S
 - 7) SSB Firestop Pillows
- C. Sealants, caulking materials, or foams for use with Penetrations by Non-Combustible Items, including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
- 1. Hilti:
 - a. (FS-ONE) High Performance Intumescent Firestop Sealant
 - b. (CP 604) Self-leveling Firestop Sealant
 - c. (CP 620) Fire Foam
 - d. (CP 606) Flexible Firestop Sealant
 - e. (CP 601 S) Elastomeric Firestop Sealant
 - 2. 3M:
 - a. Fire Barrier FB3000WT, water tight sealant (up to 4 hour rated)
 - b. Fire Barrier FD150+ Flexible sealant
 - c. Fire Barrier IC15WB+ (up to 3 hour rated)
 - d. Fire Barrier CP25 WB+ (up to 4 hour rated)
 - e. Fire Barrier FB1000 NS or FB1003 SL
 - 3. STI:
 - a. LCI Intumescent Firestop Sealant (up to 4 hour rated)
 - b. Endothermic Firestop Sealant (up to 3 hour rated)
 - c. Silicone Firestop Sealant
 - d. CF34 Closet Flange
 - e. SSP Firestop Putty

- D. Penetrations by Combustible Items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems):
1. Hilti:
 - a. (FS-ONE) High Performance Intumescent Firestop Sealant
 - b. (CP 618) Firestop Putty
 - c. (CP 642) Firestop Jacket
 - d. (CP 643) Firestop Jacket
 2. 3M:
 - a. Fire Barrier IC15WB+ Sealant (up to 3 hour rated)
 - b. Fire Barrier CP25 WB+ Sealant (up to 4 hour rated)
 - c. Fire Barrier FS-195 Wrap/Strip, Ultra GS Wrap Strip, or Tuck-In Wrap Strip
 - d. Fire Barrier FB3000WT, water tight sealant (up to 4 hour rated)
 3. STI
 - a. LCI Intumescent Firestop Sealant
 - b. SSP Firestop Putty
 - c. SSWBLU2 SSWRED2 Wrap Strip
 - d. LLC or SSC Firestop Collars
 - e. CF34 Closet Flange
- E. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
1. Hilti:
 - a. (CP 601S) Elastomeric Firestop Sealant
 - b. (CP 606) Flexible Firestop Sealant
 - c. (FS-ONE) Intumescent Firestop Sealant
 2. 3M
 - a. CP25WB+ Sealant
 - b. IC15WB+ Sealant
 - c. FB3000WT water tight Sealant
 - d. Fire Barrier Pillows and 3M Fire Barrier Self Locking Pillows
 3. STI
 - a. LCI Intumescent Firestop Sealant
 - b. FryeFlange Duct Angle
 - c. SSB Intumescent Pillows
- F. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
1. Hilti Intumescent Firestop Sealant (FS-ONE)
 2. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
 3. Hilti:
 - a. (FS-ONE) Intumescent Firestop Sealant

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- b. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
 - 1) (FS-ONE) Intumescent Firestop Sealant
 - 2) (CP 620) Fire Foam
 - 3) (CP 601 S) Elastomeric Firestop Sealant
 - 4) (CP 606) Flexible Firestop Sealant
 - 4. 3M
 - a. CP25WB+ Sealant
 - b. IC15WB+ Sealant
 - c. FB3000WT water tight Sealant
 - d. Fire Barrier Pillows and 3M Fire Barrier Self Locking Pillows
 - 5. STI
 - a. LCI Intumescent Firestop Sealant
 - b. SSP Firestop Putty
 - c. SSWBLU2 SSWRED2 Wrap Strip
 - d. LLC or SSC Firestop Collars
 - e. CF34 Closet Flange

G. Non-curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

- 1. Hilti
 - a. (CP 618) Firestop Putty Stick
 - b. (CFS-PL) Firestop Plug
- 2. 3M
 - a. MPP+ Putty Stix
 - b. MPP+ Putty Pads
- 3. STI
 - a. SSP Firestop Putty/Putty Pads (not clay based)
 - b. FP200/FP400 Firestop Plug

H. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic J-Boxes for conditions such as; switches, data, power, etc. including, the following products are acceptable:

- 1. Hilti:
 - a. (CP 617) Firestop Putty Pad
 - b. Firestop Box Insert
- 2. 3M:
 - a. Firestop MPP+ Putty Pads
 - b. Interam Endothermic Mat E05A-4
- 3. STI:
 - a. SSP Firestop Putty/Putty Pads (not clay based)
 - b. EP 44/45 Powershield Electrical Box Insert

I. Fire-Rated Construction Joints and Other Gaps:

- 1. Hilti:

- a. (CP 601 S) Elastomeric Firestop Sealant
 - b. (CP 606) Flexible Firestop Sealant
 - c. (CFS-SP WB) Firestop Joint Speed Spray
 - 1) Red
 - 2) White
 - 3) Grey
 - 2. 3M:
 - a. Firestop Sealant 2000+
 - b. Fire Dam Spray 200
 - c. Fire Dam FD150+ Flexible Firestop Sealant
 - d. Fire Barrier FB1000NS Sealant
 - 3. STI:
 - a. AS Elastomeric Spray
 - b. ES Elastomeric Sealant
 - c. LC Endothermic Sealant
 - d. Fast Track Silicone Firestop Spray
- J. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
- 1. Hilti:
 - a. (CP 642 Firestop Jacket
 - b. (CP 643N) Firestop Collar
 - c. (CP 644) Firestop Collar
 - d. (CP 648E/648S) Wrap Strips
 - e. FS-ONE) High Performance Intumescent Firestop Sealant
 - 2. 3M:
 - a. Fire Barrier PPD Plastic Pipe Device
 - b. Tuck-In Wrap Strip
 - c. Ultra GS Wrap Strip
 - d. FS195+ Wrap Strip
 - e. IC15WB+ and FB3000WT for CPVC piping
 - f. High Performance CP25WB+
 - 3. STI:
 - a. LCI Intumescent Firestop Sealant
 - b. SSWBLU2 SSWRED2 Wrap Strip
 - c. LLC or SSC Firestop Collars
 - d. RTC Adjustable Firestop Collar
 - e. CF34 Closet Flange

- K. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti:
 - a. (CP 637) Firestop Mortar
 - b. (CFS-BL) Firestop Block
 - c. (CP 620) Fire Foam
 - d. (CP 675T) Firestop Board
 - e. (FS 635) Trowelable Firestop Compound
 - f. FIRE BLOCK
2. 3M:
 - a. Firestop Pillows and Self Locking Pillows
 - b. Fire Barrier CS-195 Composite Sheet
 - c. Fire Barrier Mortar
3. STI
 - a. SSB Firestop Pillows
 - b. CS Composite Sheet
 - c. SSM Firestop Mortar

- L. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti:
 - a. (CFS-BL) Firestop Block
 - b. (CP 675 T) Firestop Board
2. 3M:
 - a. Firestop Pillows and Self Locking Pillows
 - b. Fire Barrier CS-195 Composite Sheet
3. STI:
 - a. SSB Firestop Pillows
 - b. CS Composite Sheet

- M. Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls, the following products are acceptable:

1. Hilti:
 - a. (CP 653) Speed Sleeve - with integrated smoke seal fabric membrane.
 - b. (CFS-SL SK) Firestop Sleeve
 - c. (CFS-SL RK) Retrofit Sleeve - for use with existing cable bundles.
 - d. (CFS-SL GP) Gangplate - for use with multiple cable management devices.
 - e. (CFS-SL GP CAP) Gangplate Cap - for use at blank openings in gangplate for future penetrations.
2. 3M:
 - a. Fire Barrier Pass Through Devices
 - b. Fire Barrier Pass Through Putty Sleeve Kits
3. STI:

- a. EZ Path 33 and 44 Series Devices for Cabling in Cores or Block Outs
 - b. EZ Path 33 Series Retrofit wall plate (EZDP33WR)
 - c. EZ Path 44 Series Retrofit wall Plate (EZDP144RS)
- N. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
- 1. Hilti
 - a. (CFS-BL) Firestop Block
 - b. (CFS-PL) Firestop Plug
 - 2. 3M:
 - a. Firestop Pillows and Self Locking Pillows
 - b. Fire Barrier CS-195 Composite Sheet
 - 3. STI:
 - a. SSB Firestop Pillows
 - b. CS Composite Sheet
- O. Openings between Structurally Separate Sections of Wall and Floors, Tops-of-Walls:
- 1. Hilti:
 - a. (CFS-SP WB) Firestop Joint Speed Spray
 - 1) Red
 - 2) White
 - 3) Grey
 - b. (CP 601 S) Elastomeric Firestop Sealant
 - c. (CP 606) Flexible Firestop Sealant
 - d. (CP 604) Self-Leveling Firestop Sealant
 - 2. 3M:
 - a. Fire Barrier CP 25 WB
 - b. FD150+
 - c. FD 200 Elastomeric Spray
 - 3. STI:
 - a. AS200 Series Elastomeric Spray
 - b. ES100 Elastomeric Spray
 - c. Endothermic Sealant
- P. Cast-in place firestopping of Through-Penetrations in Concrete Floors and Composite Concrete Decks, cast-in firestop devices with an integrated intumescent firestop, smoke and water seal:
- 1. Hilti:
 - a. (CP 680) Cast-In Firestop Device
 - 2. 3M:
 - a. Fire Barrier Cast-In Device for Metal Pipes
 - b. Fire Barrier Cast-In Device for Plastic Pipes
 - 3. STI:
 - a. CD Series Cast in Firestop Devices for Metal or Plastic Pipes

- Q. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

2.8 ACCESSORIES

- A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by SCAQMD, South Coast Air Quality Management District Rule No.1168.
1. Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- B. Other materials Underwriters Laboratories Inc. (UL) or Warnock Hersey classified or listed as required to meet the appropriate firestop application.
- C. High-melt-point mineral wool or ceramic fiber, unfaced; Master Products "FireMaster Bulk".
1. ASTM E84: Flame Spread 0; Smoke Development 0; Fuel Contributed 0.
 2. Non-combustible in accordance with ASTM E136.
- D. Gypsum board firestopping: ASTM C 36, Type X.
- E. Sealant, Fire-Retardant: 3M "Fire Dam 150", Dow Corning "Firestop" 2000", or approved equal for required fire rating.
1. Color as selected by Architect from manufacturer's standards.
- F. Calcium silicate board: Promadeck as manufactured by Promat Fire Protection division of Eternit, Blandon, PA.; thickness as noted on the Drawings or as required by the tested assembly.
- G. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.
- H. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- I. Fill, Void or Cavity Materials: As classified under Category XHHW in the U.L. Fire Resistance Directory.
- J. Forming Materials: As classified under Category XHKU in the U.L. Fire Resistance Directory.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping.
1. Do not proceed with installation until unsatisfactory conditions have been corrected.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping.
 - a. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
 4. Verify penetrations are properly sized and in suitable condition for application of materials.
 5. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 6. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 7. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 8. Do not proceed until unsatisfactory conditions have been corrected.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains.
1. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.
- B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration materials.
1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
 2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 3. Protect materials from damage on surfaces subjected to traffic.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" as herein indicated, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General:
 - 1. Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
 - 2. Comply with the "System Performance Requirements" article as herein specified.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping systems.
- C. Install fill materials for through-penetration firestopping systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.6 MARKING AND IDENTIFICATION

- A. Fire Walls, Fire Barriers, Fire Partitions, Smoke Barriers, and Smoke Partitions and any other wall required to have protected openings or penetrations shall be effectively and permanently identified with stenciling conforming to requirements of

1. Code compliance: **IBC 703.5**
 - a. Located in all accessible concealed floor, floor-ceiling, or attic spaces;
 - b. Locate markings where they will be visible from access openings, spacings indicated are maximums, provide additional markings when necessary to clearly denote identifications from access openings or when view of markings are obstructed by elements in the concealed space.
 - c. Repeated at intervals not exceeding **30 -feet** measure horizontally along wall or partition.
 - d. Include lettering not less than **0.5 -inch** high with the following wording: "FIRE AND OR SMOKE BARRIER – PROTECT ALL OPENINGS".
 - e. Paint specified in Section 09 9123.
- B. The Firestop contractor shall identify penetration firestopping with labels.
 1. Attach labels permanently to surfaces adjacent to and within **6 -inches (150 mm)** of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping.
 2. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels.
 3. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - a. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
 - b. Contractor's Name, address, and phone number.
 - c. Through-Penetration firestop system designation of applicable testing and inspecting agency.
 - d. Date of Installation.
 - e. Through-Penetration firestop system manufacturer's name.
 - f. Installers Name, address and phone number
- C. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.
 1. The Documentation Form for Through Penetrations shall include:
 - a. A Sequential Location Number
 - b. The Project Name
 - c. Date of Installation
 - d. Designation of applicable testing and inspecting agency.
 - e. Detailed description of the penetrations location
 - f. Manufacturer's name.
 - g. Tested System or Engineered Judgment Number
 - h. Type of assembly penetrated
 - i. A detailed description of the size and type of penetrating item
 - j. Size of opening
 - k. Number of sides of assemblies addressed
 - l. Hourly rating to be achieved
 - m. Installers Name, address and phone number

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2. The Documentation Form for Construction Joints shall include:

- a. A Sequential Location Number
- b. The Project Name
- c. Date of Installation
- d. Designation of applicable testing and inspecting agency.
- e. Detailed description of the Construction Joints location
- f. Manufacturer's name.
- g. Tested System or Engineered Judgment Number
- h. Type of Construction Joint
- i. The Width of the Joint
- j. The Lineal Footage of the Joint
- k. Number of sides addressed
- l. Hourly rating to be achieved
- m. Installers Name, address and phone number

- D. Copies of these documents are to be provided to the general contractor at the completion of the project.

3.7 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- E. Manufacturer's Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.
- F. Inspecting agency will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.
- G. Inspecting agency will report observations promptly and in writing to Contractor and Project Inspector.
- H. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.
- I. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.8 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

3.9 PENETRATION FIRESTOPPING SCHEDULE

- A. Refer to drawings for specific assemblies.
- B. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- C. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."

- END OF SECTION -

- SECTION 07 8446 -**FIRE-RESISTIVE JOINT SYSTEMS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes only tested and listed fire-resistive joint systems for the following:
 - 1. Floor-to-wall joints.
 - 2. Head-of-wall joints.
 - a. Coordinate with the deflection "Firestop Tracks" with composite intumescent material as specified in Section 09 2216 "Non-Structural Metal Framing"
 - 3. Joints in smoke barriers.
 - 4. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated walls and/or curtain walls
 - 5. Exterior conditions refer to Section 07 9213 "Exterior Façade Joint Sealants"
 - 6. Joints in or between fire-resistance-rated constructions.
 - 7. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated, exterior, insulated metal panel curtain wall system.
 - 8. Openings between structurally separate sections of wall or floors.
 - 9. Expansion joints in walls and floors.
 - 10. Edge of elevated slab Smoke and Acoustical Control assembly.

1.3 DEFINITIONS

- A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.4 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 8113 "Sustainable Design Requirements"

- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 04 2000 "Concrete Unit Masonry"
- E. Section 07 2100 "Thermal Insulation" for perimeter fire-containment insulation systems if not specified in this Section.
- F. Section 07 8100 "Applied Fireproofing" for fire protection of concealed structural members.
- G. Section 07 8413 "Penetration Firestopping" for firestopping at non-joint conditions.
- H. Section 07 9200 "Joint Sealants" for non-fire-resistive joint sealants.
- I. Section 08 4413 "Glazed Aluminum Curtain Walls"
- J. Section 09 8100 "Acoustical Insulation" for interior wall insulation.
- K. Section 09 2216 "Non-Structural Metal Framing: for framing general components and installation in addition to Firestop Tracks.
- L. Section 09 2900 "Gypsum Board".

1.5 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM E 84-02, "Standard Test Method for Surface Burning Characteristics of Building Materials"
- C. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems
- D. ASTM E 1399, "Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Width of Architectural Joint Systems"
- E. ASTM E 1966-00, "Standard Test Method for Fire-Resistive Joint Systems"
- F. ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops"
- G. ASTM E 2307, "Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus"
- H. ASTM E2837 for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies (for HXBO)
- I. ANSI/UL 2079, "Tests for Fire Resistance of Building Joint Systems"
- J. International Firestop Council Recommended (IFC) Guidelines for Evaluating Firestop Systems Engineering Judgments
- K. Manufacturer's recommendations and specifications.

FIRE-RESISTIVE JOINT SYSTEMS

- L. NFPA 101 - Life Safety Code
- M. Omega Point Laboratories, Inc. (OPL) Listed Products Directory, Volume II, updated annually:
 - 1. Fire Resistant Joint Systems
- N. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- O. Underwriters Laboratories, Inc. (UL) Fire Resistance Directory, Volume II, updated annually:
 - 1. Joint Systems (XHBN)
 - 2. Perimeter Fire Containment Systems (XHDG)
 - 3. Fire Resistance Ratings (BXRH)
 - 4. Fill, Voids, or Cavity Material (XHHW)
 - 5. Firestop Devices (XHJI)
 - 6. Forming Materials (XHKU)
 - 7. Continuity Head-of-wall Joint Systems (XHBO)
 - a. Refer to deflection "Firestop Tracks" with composite intumescent material as specified in Section 09 2216 "Non-Structural Metal Framing"

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300 "Submittal Procedures".
- B. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of tested and listed firestop systems to be used and manufacturer's installation instructions.
- C. Manufacturer's engineering judgment identification number and drawing details when no tested and listed system is available for an application. Engineering judgment shall include both project name and contractor's name who will install firestop system as described in drawing
- D. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
 - 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- E. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

- B. Qualification Data: For Installer.
 - 1. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements.
 - 2. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer
- C. Compatibility and Adhesion Test Reports: From fire-resistive joint system manufacturer indicating the following:
 - 1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- D. Submit material safety data sheets provided with product delivered to job-site.

1.8 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700 "Closeout Procedures".
- B. Warranty: Submit specified warranty.

1.9 QUALITY ASSURANCE

- A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures.
 - 1. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- B. Firestop System installation shall meet requirements of ASTM E 1966 and/or ANSI/UL 2079 tested and listed assemblies that provide fire-resistance ratings not less than that of the construction in which the joint occurs.
- C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- E. For those firestop applications that exist for which no tested and listed system is available through a manufacturer, an engineering judgment derived from similar tested and listed system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation.
 - 1. Engineering judgment drawings shall follow requirements set forth by the International Firestop Council.
- F. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

FIRE-RESISTIVE JOINT SYSTEMS

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.
 - 1) UL, Underwriters Laboratories, Inc. in its "Fire Resistance Directory.", www.ul.com
 - 2) Warnock Hersey (Intertek) / ETL, www.intertek.com
 - 3) Intertek ETL SEMKO in its "Directory of Listed Building Products".
 - 4) Factory Mutual, www.fmglobal.com
- G. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- H. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- I. Preinstallation Conference: Conduct conference at Project site .

1.10 INSTALLER QUALIFICATIONS

- A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements.
 1. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- B. A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
 1. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.
 2. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. The work is to be installed by a contractor with at least one of the following qualifications:
 1. FM 4991 "Approval of Firestop Contractors"
 2. UL Approved Contractor and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
 3. Hilti Accredited Fire Stop Specialty Contractor
- D. Installer shall have not less than three (3) years experience with fire stop installation.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multi-component materials.
- C. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- D. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- E. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- F. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- G. Do not use damaged or expired materials.

1.12 PROJECT CONDITIONS

- A. Do not use materials that contain flammable solvents.
- B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings
- C. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- D. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation per manufacturer's written instructions.
- E. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding
- F. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.
- G. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces

1.13 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's Project Inspector has examined each installation.
- D. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Provide fire-resistive joint systems for;
 - 1. Floor-to-floor joints
 - 2. Floor-to-wall joints
 - 3. Head-of-wall joints
 - 4. Wall-to-wall joints
 - 5. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls
- D. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed:
 - 1. Fire-resistance-rated non-load bearing wall, including partitions.
 - 2. Fire-resistance-rated floor assemblies.
 - 3. Exterior curtain-wall assemblies and fire-resistance-rated floor assemblies.
- E. Joint Systems in and between Fire-Resistance-Rated Construction: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.
- F. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by NFPA 285 and UL 2079.

- G. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

2.2 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, -available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following.
1. Fire-Resistive Joint Systems:
 - a. Hilti, Inc.
 - b. Specified Technologies Inc.
 - c. 3M Fire Protection Products.
 2. Perimeter Fire-Containment Systems:
 - a. Hilti, Inc.
 - b. Specified Technologies Inc.
 - c. 3M Fire Protection Products.
 3. Joints in Smoke Barriers:
 - a. Hilti, Inc.
 - b. Specified Technologies Inc.
 - c. 3M Fire Protection Products.

2.3 MATERIALS

- A. Use only firestop products that have been tested in accordance with ASTM E 1966 and/or ANSI/UL 2079 for specific rated construction conditions conforming to construction assembly type, movement capability, spacing requirements, and fire-resistance-rating involved for each separate instance.
- B. Provide a firestop system with an Assembly Rating as determined by ASTM E 1966 and/or ANSI/UL 2079 which is equal to the fire-resistance ratings of the construction in which the joint occurs.
1. Provide fire-safing insulation approved by manufacture.
 - a. Refer to Section 07 2100 "Thermal Insulation" for more information.

2.4 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Provide firestopping composed of components that are compatible with each other and substrates forming joints under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- C. Provide components for each fire-resistive joint system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

FIRE-RESISTIVE JOINT SYSTEMS

- D. Joints in or between Fire Rated Construction: Provide joint firestopping systems with ratings determined per UL 2079 or ASTM E 1966:
 - 1. F-Rating: not less than the fire resistance rating of the construction they will join.
- E. Joints at Exterior Curtain Wall / Floor Intersections: Provide joint firestopping systems with ratings determined per ASTM E 2307:
 - 1. F-Rating: not less than the fire resistance rating of the construction they will join.
- F. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079:
 - 1. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- G. Joints at Intersection between Rated Wall Assemblies and Nonrated Horizontal Assemblies: Provide joint firestopping systems with ratings determined by ASTM E 2837.
- H. Mold Resistance: Provide joint firestopping system sealant with mold and mildew resistance rating of 0 as determined by ASTM G21.
- I. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- J. Accessories: Provide components of fire-resistive joint systems, including forming materials that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article.
 - 1. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.5 MATERIALS - FIRE-RESISTIVE JOINT SYSTEMS

- A. Where UL-classified fire-resistive joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Sealants for use with fire-resistance-rated construction joints, the following products are acceptable:
 - 1. Hilti (CFS-SP) WB Joint Spray
 - 2. Hilti (CP 601S) Elastomeric Firestop Sealant
 - 3. Hilti (CP 606) Flexible Firestop Sealant
 - 4. Hilti (CP 604) Self-leveling Firestop Sealant
- C. Floor-to-Wall, Fire-Resistive Joint System:
 - 1. Basis-of-Design UL-Classified Product: FW-D 1013.
 - 2. Assembly Rating: 1 hour or greater.
 - 3. Joint Width: As indicated on drawings.
 - 4. Movement Capabilities: Minimum of 40 percent compression, extension, or horizontal shear. Tested 500 cycle testing in accordance with ICBO ES AC and meets ASTM E 1966

- D. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal deck profile; use as a backer for spray material.
1. Hilti (CP 777) Speed Plugs
 2. Hilti (CP 767) Speed Strips
- E. Head-of-Wall, Fire-Resistive Joint System:
1. General:
 - a. Coordinate installation and products with Section 09 2216 "Non-Structural Metal Framing" and Drawings.
 - b. Shaft wall assemblies coordinate with Section 09 2116 "Gypsum Board Shaft Wall Assemblies"
 2. **SYSTEM:** Basis-of-Design UL-Classified Product: XHBO
 - a. XHBO systems in accordance with ASTM E2837 (Dynamic and Continuity Joint – Static)
 - 1) Designs:
 - a) UL System CJ-D-0004 x 2 hour x 1 1/2 -inch nom. Width x 50 percent compression & extension
 - b) UL System CJ-D-0008 1 hour x 2 -inch nom. Width x 100 percent compression & extension
 - c) UL System CJ-D-0009 1 hour x 2-inch nom. Width x 100 percent compression & extension
 - d) UL System CJ-D-0010 1 hour x 2-inch nom. Width x 100 percent compression & extension
 3. **TRACK:** Basis-of-Design UL-Classified Product, HW-D Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
 - a. Mfg: Refer to Section 09 2216 Non-Structural Metal Framing"
- F. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.
1. L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 -inch wg (74.7 Pa) at both ambient and elevated temperatures.
 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hilti, Inc.
 - b. Specified Technologies Inc.
 - c. 3M Fire Protection Products.
- G. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- H. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

- I. Provide a firestop system with an Assembly Rating as determined by ASTM E 1966 and/or ANSI/UL 2079 which is equal to the fire-resistance ratings of the construction in which the joint occurs.
- J. VOC Content: Fire-resistive joint system sealants shall comply with the following limits:
 - 1. Maricopa County, Arizona, Air Quality Department.
 - 2. Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"

2.6 PERIMETER FIRE BARRIER (CONTAINMENT) SYSTEMS

- A. Where UL-classified perimeter fire-containment systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHDG.
- B. Fire Spray / Sealants and Mineral Wool batt safing for use as part of a Perimeter Fire Barrier System between fire-resistance-rated floors and exterior wall assemblies, the following products are acceptable:
 - 1. Fire Safing:
 - a. Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
- C. Perimeter Fire-Containment Systems: 1 Hour (UL Classified Product)
 - 1. **CEJ 526 P (HI/BP 60-01):** Glass infill panels (Spandrel) at curtain wall window framing
 - a. "F" Rating: 1 -hours.
 - b. "T" Rating: 54 minutes.
 - c. Linear Opening Width: 6 -inches, maximum.
 - d. Movement Capabilities: ASTM E 1399-97
 - 1) Rated for 5 percent Vertical shear
 - e. Standard: ASTM E 2307
 - f. Materials:
 - 1) Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
 - 2) Hilti (CP 672) Firestop Joint (Speed) Spray or
 - 3) Hilti (CFS-SP WB) Firestop Joint Spray
 - 4) Support clips.
 - 5) Reinforcing angle along back of spandrel glazing at slab edge
 - 6) Curtain wall insulation
- D. Perimeter Fire-Containment Systems: 2 Hour (UL Classified Product)
 - 1. **CW-S-1007:** At concrete wall panels (Spandrel) – lightweight or normal weight
 - a. "F" Rating: 2 -hours.
 - b. "T" Rating: 1/4 -hour.
 - c. Integrity Rating: 2 -hours.
 - d. Insulation Rating: 1/4 -hour.
 - e. Linear Opening Width: 6 -inches (152 mm), maximum.
 - f. Materials:
 - 1) Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
 - 2) Hilti (CFS-SP WB) Firestop Joint Spray or

- 3) Hilti (CP 672) Firestop Joint Spray or
 - 4) Hilti (CP 672 FC) Firestop Joint Spray
 - g. Vertical Joints between spandrel panels: Joint System No. WW-S-0042
2. **CW-D-1003:** At concrete wall panels (Spandrel) – lightweight or normal weight
- a. Integrity Rating: 2 -hours.
 - b. Insulation Rating: 1/4 -hour.
 - c. Linear Opening Width: 6 -inches (152 mm), maximum.
 - d. Class II Movement Capabilities – 5 percent Vertical Shear
 - e. Materials:
 - 1) Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
 - 2) Hilti (CP 604) Self Leveling Sealant
3. **CW-D-1001:** At concrete wall panels (Spandrel) – lightweight or normal weight
- a. Integrity Rating: 2 -hours.
 - b. Insulation Rating: 1/4 -hour.
 - c. Linear Opening Width: 6 -inches (152 mm), maximum.
 - d. Class II Movement Capabilities – 5 percent Vertical Shear
 - e. Materials:
 - 1) Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
 - 2) Hilti (CP 672) Firestop Joint Spray
 - f. Vertical Joints between spandrel panels: Joint System No. WW-S-0042
4. **CEJ 245 P (HI/BP 135-01):** At concrete infill panels (Spandrel) at window framing
- a. "F" Rating: 2 1/4 -hours.
 - b. "T" Rating: 2 1/4 -hours.
 - c. "L" Rating: N/A
 - d. Linear Opening Width: 6 -inches (152 mm), maximum.
 - e. Movement Capabilities: Rated for 12.5 percent
 - f. Standard: ASTM E 2307
 - g. Materials:
 - 1) Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
 - 2) Hilti (CP 672) Firestop Joint (Speed) Spray
 - 3) Support clips.
5. **CEJ 246 P (HI/BP 120-01):** Glass infill panels (Spandrel) at curtain wall window framing
- a. "F" Rating: 2 -hours.
 - b. "T" Rating: 1 1/4 -hours.
 - c. "L" Rating: N/A
 - d. Linear Opening Width: 8 -inches, maximum.
 - e. Movement Capabilities: Rated for 15 percent
 - f. Standard: ASTM E 2307
 - g. Materials:

- 1) Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
- 2) Hilti (CP 672) Firestop Joint (Speed) Spray
- 3) Support clips.
- 4) Reinforcing angle along back of spandrel glazing at slab edge
- 5) Curtain wall insulation

6. CEJ 127 P (HI/JS 120-05): Glass infill panels (Spandrel) at curtain wall window framing

- a. "F" Rating: 2 -hours.
- b. "T" Rating: 2 -hours.
- c. "L" Rating: N/A
- d. Linear Opening Width: 8 -inches, maximum.
- e. Movement Capabilities: Class IV – ASTM E 1339/ASTM E 2307
 - 1) Rated for +/- 6.5 percent Vertical shear @ 25 percent compression
- f. Standard: ASTM E 2307
- g. Materials:
 - 1) Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
 - 2) Hilti (CP 672) Firestop Joint (Speed) Spray or
 - 3) Hilti (CP 672) Fast Cure or
 - 4) Hilti (CFS-SP WB) Firestop Joint Spray
 - 5) Support clips.
 - 6) Reinforcing angle along back of spandrel glazing at slab edge
 - 7) Curtain wall insulation

2.7 PERIMETER EDGE OF SLAB – SMOKE AND ACOSUTICAL(CONTAINMENT) SYSTEMS

- A. Rating: None
- B. Assembly:
 1. Smoke and Acoustical compound over mineral wool safing material held in place with support clips.
- C. Materials:
 1. Thermafiber - Type SAF (Synthetic Vitreous Fiber) Mineral Wool batts
 2. Hilti (CP 506) Smoke & Acoustic Spray or
 3. Hilti (CP 572) Smoke & Acoustic Spray
 4. Support clips.

2.8 FIRE CONTAINMENT CURTAIN WALL SYSTEM

- A. UL System CW-S-2001 or CW-S-2002 by Thermafiber, www.thermafiber.com, comprised of the following.
 1. Thermafiber Curtain Wall Insulation, mechanically attached to mullions and transoms with impaling pins, screws or other positive attachments
 2. Firespan Insulation Mullion Covers.

3. Safing insulation, minimum 1/2 -inch wider than opening, compression fit into safe-off area and supported with safing Z Clips.
4. Steel angle or channel placed horizontally at the safing line, attached to vertical mullions, within the insulation at a horizontal splice, or behind the insulation attached to the vertical mullions. Prevent bowing out of curtain wall insulation due to compression fit of safing insulation.
5. Firecode Compound installed minimum 1 -inch thick over safing insulation (forming material) to form tight smoke seal and effective thermal barrier.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.
- B. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 1. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 2. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 3. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 4. Do not proceed until unsatisfactory conditions have been corrected.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to

remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General:
 - 1. Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
 - 2. Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article.
- B. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Listed Products Directory.
- C. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of construction joint materials.
 - 1. Protect materials from damage on surfaces subjected to traffic.
- D. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- E. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 MARKING AND IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels.
 - 1. Attach labels permanently to surfaces adjacent to and within 6 -inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system.
 - 2. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - a. Label:
 - 1) The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2) Contractor's name, address, and phone number.
 - 3) Designation of applicable testing agency.
 - 4) Date of installation.
 - 5) Manufacturer's name.

- 6) Installer's name.
3. Requirements:
 - a. Attach labels permanently to surfaces adjacent to and within 6 -inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system.
 - b. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed.

3.5 FIELD QUALITY CONTROL

- A. Examine sealed joints to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities and/or independent inspection agency.
- C. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- D. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistive joint systems and to prepare inspection reports.
 1. Project Inspector will state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- E. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- F. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistive joint systems.
- G. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
- H. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements. If deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

FIRE-RESISTIVE JOINT SYSTEMS

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.
- B. Designation System for Joints at the Intersection of Fire-Resistance-Rated Floor or Floor/Ceiling Assembly and an Exterior Curtain-Wall Assembly: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHDG:
- C. Refer to drawings for specific assemblies required.

- END OF SECTION -

- SECTION 07 9200 -

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes joint sealants and backing for the following applications, including those specified by reference to this Section, and as noted in the schedule at the end of Part 3 of this section:
 - 1. Interior Joints where occur and as specified.
 - 2. For sound isolation in partitions and ceilings.
 - 3. To make building watertight and weatherproof.
 - 4. To fill an exposed joint between materials which do not fit tightly together.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 07 8413 "Penetration Firestopping" for sealing joints in fire-resistance-rated construction.
- D. Section 07 8446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
- E. Section 07 9213 "Exterior Facade Joint Sealants". Sealants for Exterior joints in façade cladding.
- F. Section 08 8000 "Glazing" for glazing assembly sealants.
- G. Section 09 2900 "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
- H. Section 09 3013 "Ceramic Tile" for sealing tile joints.

- I. Section 09 5113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.
- J. Section 09 6723 "Resinous Flooring"
- K. Division 22 "Plumbing Fixtures" for sealing joints between fixtures and wall and floor surfaces.
- L. Pertinent Sections specifying sealants for paving.

1.4 REFERENCED STANDARDS

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Manufacturer's recommendations and specifications.
- C. ASTM C 834 - Standard Specification for Latex Sealants.
- D. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications.
- E. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
- G. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell).
- H. American Concrete Institute 302.1R-04 "Guide for Concrete Floor and Slab Construction": Standards for concrete joint fillers.
- I. American Concrete Institute 360R-10 "Guide to Design of Slabs-on-Ground": Standards for concrete joint fillers.

1.5 ACTION SUBMITTALS

- A. Itemized list of Manufacturers and Subcontractors
 - 1. Include: Listing of all companies providing products and services for this section
 - 2. Schedule: Not more than two (2) weeks after contract award.
- B. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant colors (multiple colors will be required).
 - 5. Schedule: Not more than two (2) weeks after contract award.
- C. Sealant Product Data and Selection Samples: For each type of product indicated
 - 1. Include standard data sheet demonstrating compliance with specified attributes.

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2. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
 3. Manufacturer's Installation Instructions: Include methods for storage, handling, mixing, priming, installation, curing and protection.
 4. Provide certification by joint sealant manufacturer that materials provided for this Section are 100% asbestos-free.
 5. Schedule: Not less than two (2) weeks before on-site mock ups
- D. Backer Rod Product Data and Selection Samples:
1. Include: For each type of product indicated, demonstrate compliance with specified attributes.
 2. Include four (4) 12" long samples from manufacturers for each backer rod product required.
 3. Schedule: Not less than two (2) weeks before on-site mock ups
- E. Sealant Testing Reports:
1. Include: One (1) copy of sealant manufacturer's report on compatibility, staining and adhesion tests
 2. Schedule: Not less than two (2) weeks before on-site mock ups.
 3. Test results required by ASTM C920 using specified substrate materials,
- F. Verification Samples:
1. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch (13-mm-) wide joints formed between two 12-inch-(300-mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
 2. Architect's review is for color only.
 3. Schedule: Not less than two (2) weeks before on-site mock ups
- G. Installation Procedures:
1. For each sealant product and substrate, include installation procedures listing cleaning, masking, priming, tooling and other actions necessary to provide function as specified and satisfactory appearance of joint and adjoining substrates. Correlate and cross-reference these specific procedures with the generic manufacturer instructions provided separately.
- H. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

- C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- G. Field-Adhesion Test Reports: For each sealant application tested.
- H. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- A. Applicator Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- E. Preinstallation Conference: Conduct conference at Project site.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

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2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:
 - a. Each kind of sealant and joint substrate indicated.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.10 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When joint substrates are wet.

- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.11 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

1.12 WARRANTY

- A. Provide a warranty, in writing and signed jointly by the installer and sealant manufacturer, agreeing to replace any or all joints failing within the warranty period at not cost to the Owner, labor and material inclusive.
 - 1. Warranty: Five (5) years

1.13 EXTRA MATERIAL

- A. Furnish extra materials from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 - 1. Coatings Quantity: Furnish one unused tube of each type and color of exterior sealant applied.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Provide joint sealants for applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.
- C. Design Requirements:
 - 1. Seal building joints with non-sag type sealant.
 - 2. Seal floor joints with self-leveling or slope grade self-leveling type sealant.

2.2 PERFORMANCE REQUIREMENTS:

- A. Seal the following joints with joint sealer:

JOINT SEALANTS

- a. Expansion and control joints in walls.
 - b. Joints between metal panels.
 - c. Joints between door and window frames and adjacent materials.
 - d. Joints between cabinets and countertops and walls.
 - e. Control joints in interior partitions, including portion above ceilings.
 - f. Expansion and control joints in solid soffits.
 - g. Control joints in ceilings and soffits.
 - h. Open joints in concrete paving.
- 2. Apply continuous bead of joint sealer in the following locations during installation of materials specified elsewhere:
 - a. In lap joints of sheet metal construction.
 - b. Between partition floor and ceiling tracks and adjacent construction.
 - c. Between end stud of partition and adjacent construction.
 - d. Under door sills.
 - 3. Acoustic Sealants at acoustic separations shall make assembly airtight.
 - a. Seal perimeter and intersections of finish.
 - b. Seal around electrical boxes and other penetrations of finish; seal holes within electrical boxes; seal conduit ends.
 - c. Seal pipes which penetrate acoustic separations.
 - 4. Joints not specifically mentioned above which require sealants to meet the performance criteria cited in this section.
- B. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.3 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide colors matching selections made by Architect from manufacturer's full range of colors for products of type indicated. Colors may be listed in schedule at the end of this section or on the drawings. Request color selection for all products listed without a preselected color.

2.4 MANUFACTURERS

- A. Provide products by one of the following manufacturers as listed below:
 1. Substitutions: Section 01 2500.

2.5 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. Sika Corporation, Construction Products Division; SikaSil-C990.
- B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 795.
 - b. Sika Corporation, Construction Products Division; SikaSil-C995.
- C. Single-Component, Nonsag, One Part RTV Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, designed for adhering to low energy surfaces common in sheet or peel and stick weather resistant barriers.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 758.

2.6 URETHANE JOINT SEALANTS

- A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sika Corporation, Construction Products Division; Sikaflex - 1a.
 - b. BASF Building Systems; Sonolastic NP1.
- B. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT, M, A and O; capable of 50% extension and compression movement..
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
 - b. BASF Building Systems; Sonolastic NP 2.

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- C. Single component Polyurethane, ASTM C 920; self-leveling, Grade P, Class 25, Uses T, M and A;. Approved by manufacturer for wide joints up to 1-1/2 inches.
 - 1. BASF Building Systems; Sonneborn SL-2 Slope Grade or Self Leveling Sealant
 - 2. Sika Corporation, Construction Products Division; Sikaflex 2C SL.

2.7 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 786-M White.
 - b. GE Construction Sealants; SCS1700 Sanitary.

2.8 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, nonsag, paintable, nonstaining. ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolac.
 - b. Pecora Corporation; AC-20
 - c. Sherwin Williams, 950A.

2.9 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant; ASTM C-834, nonsag, paintable, nonstaining latex sealant. Effectively reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90. :
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; AC-20 FTR.

2.10 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated], and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.11 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
- D. Spall Repair Mortar: Two-component structural epoxy binder and sand aggregate, producing a mortar that is easily worked and troweled. Early-set system designed specifically for the repair of industrial concrete floors subject to hard wheeled traffic. Compatible with joint filler and recommended by the joint filler manufacturer in writing.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armor-Hard by Metzger-McGuire.
 - b. Substitutions: Section 01 2500.

2.12 FUEL RESISTANT TRAFFIC SEALANT

- A. Two-part, chemically-curing, cold-applied self-leveling modified polyurethane elastomeric sealant that withstands heavy vehicular traffic and fuel, hydraulic fluids, oil or lubricants.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Pecora Corporation; Urexpam® NR-300.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

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1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Spall Repair: Repair spalled joints in concrete slabs to produce joints of profiles recommended by joint sealer manufacturers.
- C. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- E. Remove sealant and prepare joints in existing exterior locations as directed by representative of sealant manufacturer specified in this work.

3.3 INSTALLATION OF TYPICAL JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 2. Provide flush joint configuration, per Figure 8B in ASTM C 1193, where indicated.
 - 3. Provide recessed joint configuration, per Figure 8C in ASTM C 1193, of recess depth and at locations indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
- F. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 -feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 -feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether

joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
- B. Clean excess adhesive from exposed surfaces of neoprene compression seal with solvent cleaner as recommended by manufacturer.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.7 SEALANT SCHEDULE

- A. Intent of this section is to specify sealants for all interior joints. Provide sealants listed in PART 2 for all interior joints.
- B. Architect will provide color selections and locations for each sealant type and for Contractor's use. Not all locations will have the same color. Custom colors will be required.
- C. Exterior Locations: Sealants as specified in Section 07 9213.
- D. Interior Locations:
 1. Expansion and control joints:
 - a. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT, M, A and O; capable of 50% extension and compression movement.
 - b. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 - c. Around perimeters of frames where door, window and louver frames abut concrete, masonry or other building materials.
 - d. Expansion and control joints in masonry walls.
 - e. Masonry at dissimilar material or at dissimilar masonry.

- f. Sills and thresholds.
 - g. At miscellaneous locations where sealant is shown on Drawings.
- 2. Interior Concrete Slabs on Grade: Exterior or Interior Horizontal Expansion Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component.
- 3. Interior wet areas, around plumbing fixtures, countertops abutting walls, food service applications: Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT, A and O. .
 - a. Use Laticrete sealant for system warranty.
- 4. Interior static dry joints as required to dress appearance: Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
- 5. Where required for sound control: Acoustical Sealant, ASTM C-834.
- 6. Where required for sound control with limited flame spread: Acoustical Sealant, ASTM C-834, fire-rated type.
- 7. Interior Concrete Slab Floors (On-Grade or Suspended) of generator or fuel storage tank rooms: Fuel Resistant Traffic Sealants.

- END OF SECTION -

- SECTION 07 9213 -**EXTERIOR FACADE JOINT SEALANTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes joint sealants and backing for the following applications, including those specified by reference to this Section, and as noted in the schedule at the end of Part 3 of this section:
 - 1. Exterior joints where occur and as specified.
 - a. Preparation
 - b. Priming
 - c. Packing
 - d. Sealing
 - 2. To make building watertight and weatherproof.
 - 3. To fill an exposed joint between exterior materials which do not fit tightly together.
 - 4. Custom color for joint sealant at Precast Architectural Concrete Specialties.
- B. Include all the following
 - 1. Joints in field samples and mock-up specimens, both on-site and in the shop or field.
 - 2. Joints in curtain wall, storefronts, windows, and joints between these assemblies and adjacent materials and cladding.
 - 3. Joints in exterior cladding: EIFS, plaster, masonry, panelized cladding, and similar exterior materials listed as related work and as shown on the drawings.
 - 4. Joints in sheet metal and metal copings and joints between these assemblies and adjacent materials and cladding.
 - 5. All other exterior façade joints.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4553 "Facade Mockup Testing".

- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Pertinent Sections of other Divisions specifying Exterior Insulation and Finish System, Wall Panels, masonry veneer, plaster, tile, curtainwall, storefront, doors, windows and other finishes used as exterior cladding.
- E. Section 04 2115 "Adhered (Thin) Brick Masonry"
- F. Section 04 4200 "Exterior Stone Cladding"
- G. Section 07 2419 "Water Drainage Exterior Insulation and Finish System (EIFS)"
- H. Section 07 9200 "Joint Sealants" for interior sealants.
- I. Section 08 4113 "Aluminum Framed Entrances and Storefronts".
- J. Section 08 4413 "Glazed Aluminum Curtain Walls"
- K. Section 08 8013 "Exterior Glazing" for insulating-glass requirements.
- L. Section 09 3053 "Exterior Tiling"
- M. Division 22 "Plumbing Fixtures" for sealing joints between fixtures and wall and floor surfaces.
- N. Division 32 Sections specifying sealants for paving.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Manufacturer's recommendations and specifications.
- C. ASTM – American Society for Testing and Materials
 - 1. ASTM C509 - Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
 - 2. ASTM C510, Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants
 - 3. ASTM C717, Standard Terminology of Building Seals and Sealants
 - 4. ASTM C718, Standard Test Method for Ultraviolet (UV) Cold Box Exposure of One-Part Elastomeric, Solvent-Release Type Sealants
 - 5. ASTM C719, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
 - 6. ASTM C793, Standard Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants
 - 7. ASTM C794, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
 - 8. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
 - 9. ASTM C1184, Standard Specification for Structural Silicone Sealants

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10. ASTM C1193, Standard Guide for Use of Joint Sealants
11. ASTM C1248, Standard Test Method for Staining of Porous Substrates by Joint Sealants
12. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell).
13. ASTM D2203, Standard Test Method for Staining from Sealants

1.5 ACTION SUBMITTALS

- A. Itemized list of Submittals.
 1. Include: Complete list of all submittals required for this section, list specification sections and drawing references to document completeness.
 2. Schedule: Before all other submittals. Not more than two (2) weeks after contract award.
- B. Itemized list of Manufacturers and Subcontractors
 1. Include: Listing of all companies providing products and services for this section
 2. Schedule: Not more than two (2) weeks after contract award.
- C. Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant colors (multiple colors will be required).
 5. Schedule: Not more than two (2) weeks after contract award.
- D. Sealant Product Data and Selection Samples: For each type of product indicated
 1. Include standard data sheet demonstrating compliance with specified attributes.
 2. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
 3. Manufacturer's Installation Instructions: Include methods for storage, handling, mixing, priming, installation, curing and protection.
 4. Provide certification by joint sealant manufacturer that materials provided for this Section are 100% asbestos-free.
 5. Schedule: Not less than two (2) weeks before on-site mock ups.
 6. Custom color samples for sealant at joints between Precast Architectural Concrete Specialties.
- E. Backer Rod Product Data and Selection Samples:
 1. Include: For each type of product indicated, demonstrate compliance with specified attributes.
 2. Include four (4) 12 -inch long samples samples from manufacturers for each backer rod product required.
 3. Schedule: Not less than two (2) weeks before on-site mock ups
- F. Sealant Testing Reports:
 1. Include: One (1) copy of sealant manufacturer's report on compatibility, staining and adhesion tests

2. Schedule: Not less than two (2) weeks before on-site mock ups.
3. Test results required by ASTM C920 using specified substrate materials,

G. Verification Samples:

1. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch (13-mm-) wide joints formed between two 12-inch (300-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
2. Architect's review is for color only.
3. Schedule: Not less than two (2) weeks before on-site mock ups

H. Installation Procedures:

1. For each sealant product and substrate, include installation procedures listing cleaning, masking, priming, tooling and other actions necessary to provide function as specified and satisfactory appearance of joint and adjoining substrates. Correlate and cross-reference these specific procedures with the generic manufacturer instructions provided separately.

I. VOC Submittals:

1. This first article is most common, applies to almost every section.
2. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Manufacturer's Certifications and Standard Testing:
 1. Manufacturer's letter written for this project, attesting sealant conditions and usage with certification that all products are recommended for indicated use, fully meet specifications and will not cause staining or change in appearance of substrate.
 2. Standard Test Reports: Submit for record only,
 - a. Tests for adhesion to specified substrates, including twenty-one day water immersion.
 - b. Documentation of product performance in accordance with ASTM C920.
 - c. Tests for staining of substrates.
 3. Schedule: Not less than two (2) weeks before on-site mock ups.
- D. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

- F. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- G. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- H. Field-Adhesion Test Reports: For each sealant application tested.
- I. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
- B. Installer / Applicator Qualifications:
 - 1. Single Source Subcontractor responsible for sealing all joints and components of the exterior cladding, coordinated with the installation of the exterior cladding assemblies.
 - 2. Manufacturer's authorized representative who is trained and approved for installation of sealants required for this Project.
 - 3. Minimum of ten (10) years successful experience in work similar to that required for this project.
- C. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- D. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- E. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- F. Preinstallation Conference: Conduct conference at Project site. Convene two weeks before starting work of this section. Attendance required: Installer, installer of each component of associated work, installers of substrate construction to receive sealant work, installers of work penetrating walls and other work in the surrounding area that must precede or follow sealant work (including mechanical work if any), Architect, Owner, sealant manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, test agencies, and governing authorities. Objectives include:

1. Review preparation and installation procedures and coordinating and scheduling required with related work.
2. Review methods and procedures related to sealant work.
3. Review structural loading limitations of adjacent construction.
4. Review sealant systems requirements (drawings, specifications, and other contract documents).
5. Review required submittals, both completed and yet to be completed.
6. Review and finalize construction schedule related to sealant and facade work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make required progress and avoid delays.
7. Review required inspection, testing, certifying, and material usage accounting procedures.
8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including provision of temporary waterproofing for occupied spaces where applicable.
9. Record discussion of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending.
 - a. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
10. Expected weather conditions and procedures for inclement conditions.
11. Review notification procedures for weather or non-working days.
12. Accepted mockup shall be standard to which future sealant work must conform

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants. Purpose of testing shall be to assure products provided are suitable for the application, have not deteriorated during storage, nor will fail or stain substrates, while remaining fully with the specified Warranty coverage.
1. Use manufacturer's standard test method and in accordance with requirements of Section 01 4553 Facade Mockup Testing, to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
- B. Preconstruction Testing: Before installing sealants, field test as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each application indicated below:
 - a. Each kind of sealant and joint substrate indicated.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected.

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4. Timing of Tests:
 - a. Perform tests between 24 and 72 hours prior to initial application.
 - b. Prior to use of each new delivery of materials
 - c. Minimum of twice per month for stored materials.
 5. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 6. Field-Adhesion Testing:
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 7. Staining of Substrates Testing:
 - a. Test on project substrate materials, using sealants of project-selected color, performed both wet and dry on joints sizes and configurations approximating those found in the design.
 - b. Substrate shall not be "waterproofed" beyond the sealant joint.
 8. Provide log of testing on Contractor's letterhead for each test performed indicating:
 - a. Project Name
 - b. Date
 - c. Sealant product, name, type, production batch number, other information necessary to identify materials.
 - d. Test performance and evaluation (acceptable, not acceptable, .
 - e. Conditions of storage, (complying with manufacturer, or not).
 - f. Name and signature of person performing test.
 9. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate.
 - a. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 10. Report whether sealant stains joint substrates. Include data on color and type of staining associated with each kind of product and joint substrate.
 - a. For sealants that stain substrates, manufacturer shall recommend alternate products with equivalent performance, retest until satisfactory result is obtained.
 11. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory.
 - a. Notify Architect and Contractor of unacceptable materials.
 - b. Do not use sealants that fail to adhere to joint substrates during testing.
 - c. Remove failed materials from the site.
- C. Mockups: Provide sealants of specified type in joints of mockups of exterior cladding, curtainwall and similar assemblies as described in related sections, for review as a part of the overall assembly.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period and date for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- C. Discard materials stored for periods exceeding maximum recommended shelf life.

1.10 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.11 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealants to occur not less than 21 but not more than 30 days after completion of waterproofing, unless otherwise indicated.

1.12 WARRANTY

- A. Provide a warranty, for a period of ten (10) years, in writing and signed jointly by the installer and sealant manufacturer, agreeing to replace within the warranty period at no cost to the Owner, labor and material inclusive, any or all joints failing to provide airtight and watertight joints for any reason, or which have, or appear to have failed in:
 - 1. Stain Resistance
 - 2. Adhesion
 - 3. Cohesion
 - 4. Migration Resistance
 - 5. Abrasion Resistance
 - 6. Other form of apparent deterioration

1.13 EXTRA MATERIAL

- A. Furnish extra materials from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 - 1. Coatings Quantity: Furnish one (1) unused tube/sausage of each type and color of exterior sealant applied.

PART 2 - PRODUCTS**2.1 SYSTEM DESCRIPTION**

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Design Requirements:
 - 1. Sealing building envelope:
 - a. Seal building joints with non-sag type sealant.
 - b. Utility penetrations in exterior walls, including subgrade and floors to subgrade.

2.2 PERFORMANCE REQUIREMENTS

- A. Performance Requirements:
 - 1. Building envelope:
 - a. Make continuously watertight and weatherproof, permanent within recognized limits of aging and wear for each application.
 - b. Exterior work that does not remain watertight and all work which does not retain all properties inherent in the product as stipulated by the manufacturer will be considered faulty.
 - 2. Seal the following joints with joint sealer:
 - a. Expansion and control joints in exterior walls, copings, parapets.
 - b. Joints between exterior metal panels.
 - c. Joints between door and window frames and adjacent materials.
 - d. Expansion and control joints in solid exterior soffits.
 - 3. Apply continuous bead of joint sealer in the following locations during installation of materials specified elsewhere:
 - a. In lap joints of exterior sheet metal construction.
 - b. Under exterior door sills.
 - 4. Joints not specifically mentioned above which require sealants to meet the performance criteria cited in this section.
- B. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

- C. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide colors matching selections made by Architect from manufacturer's full range of colors for products of type indicated. Colors may be listed in schedule at the end of this section or on the drawings. Request color selection for all products listed without a preselected color.

2.3 MANUFACTURERS

- A. Provide products as listed below:
 - 1. Substitutions: Section 01 2500.

2.4 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. Sika Corporation, Construction Products Division; SikaSil-C990.
- B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
 - 1. Color: Custom color for joints between exterior Precast Architectural Concrete Specialties.
 - 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 795.
 - b. Sika Corporation, Construction Products Division; SikaSil-C995.
- C. Single-Component, Nonsag, One Part RTV Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, designed for adhering to low energy surfaces common in sheet or peel and stick weather resistant barriers.

EXTERIOR FAÇADE JOINT SEALANTS

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 758.
- D. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT, A and O.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Omnipus.
 - b. Dow Corning Corporation; 786 Mildew Resistant.
 - c. GE Advanced Materials - Silicones; Sanitary SCS1700.
- E. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; SL Parking Structure Sealant.
- F. Multicomponent, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade P, Class 100/50, for Use T.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; FC Parking Structure Sealant.

2.5 URETHANE JOINT SEALANTS

- A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sika Corporation, Construction Products Division; Sikaflex - 1a.
 - b. BASF Building Systems; Sonolastic NP1.
- B. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT, M, A and O; capable of 50% extension and compression movement..
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
 - b. BASF Building Systems; Sonolastic NP 2.

2.6 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 300.
 - b. Pecora Corporation; BC-158.
- B. Non-Skinning Butyl Sealant for sheet metal lap joints:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sika Corporation, Construction Products Division; Sikalastomer - 511.

- b. Type recommended by manufacturer to suit application and meeting requirements of this section.

2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and proved compatible by testing, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer in writing for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
 - 1. A primer is required for sealing structural silicon to fluoropolymer coatings.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials and recommended in writing, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected. Proceeding with work indicates acceptance of conditions
- B. Coordinate with related work using sealants which may be adjacent to or in direct contact with sealants specified in this section. Be responsible for satisfactory compatibility and specified performance of sealants installed by this section.

- C. Isolate or otherwise prevent incompatible sealants from contact or reaction, as recommended by their respective manufacturers.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete by washing, grinding or mechanical abrading or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Ensure complete removal of protective coatings on metallic surfaces. Clean joints protected with tape or strippable films with cleaners after removal of tape or film. Do not allow cleaners to air dry without wiping excess.
- B. Joint Conditions: Widths, depths and conditions detailed by related sections are minimum allowable requirements except where in conflict with sealant manufacturer recommendations.
1. All joints are to be uniform in width.
 2. Do not install sealant until joints are in compliance with details or sealant manufacturer recommendations.
 3. Make joints of sufficient width and depth, clean and raked, to accommodate specified joint fillers and sealants.
- C. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- E. Remove sealant and prepare joints in existing exterior locations as directed by representative of sealant manufacturer specified in this work.

3.3 INSTALLATION OF TYPICAL JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
 - 1. Consult manufacturer for recommendations for application when air temperatures or surface temperatures of sealant contact are outside manufacturer absolute recommended limits.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Do not install sealants without backings. Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
 - 3. Install backing to avoid stretching, twisting or abrading.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Avoid getting sealants on adjacent façade materials.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Tool joints dry. Do not use water or wet tooling agents.
 - 1. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 2. Provide flush joint configuration, per Figure 8B in ASTM C 1193, where indicated.
 - 3. Provide recessed joint configuration, per Figure 8C in ASTM C 1193, of recess depth and at locations indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Conform to the requirements of Section 01 4553.

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- B. Maintain complete record of all testing (including samples) for review by Architect or consultant during factory inspections.
1. Installer records shall identify date and time of structural glazing work and sealant batch number of materials used for each unit or panel.
- C. Manufacturer Field Services:
1. Manufacturer shall provide instruction to Contractor field staff on installation methods and techniques necessary to achieve maximum performance and life span of sealants, including actions to avoid staining or discoloration of substrates.
- D. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 -feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 -feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
 2. Submit test results immediately upon completion.
 3. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 4. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- E. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
- F. Test sealants in place periodically, in addition to field-adhesion testing, using methods recommended by sealant manufacturer. Replace sealants which do not adhere, stain substrates or which fail to cure.

3.5 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
- B. Clean excess adhesive from exposed surfaces of neoprene compression seal with VOC-compliant solvent cleaner as recommended by manufacturer.
- C. Final cleaning of this work shall be provided by the Installer.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.7 SEALANT SCHEDULE

- A. Intent of this section is to specify sealants for all exterior joints. Provide sealants listed in PART 2 for all joints.
- B. Architect will provide color selections and locations for each sealant type and for Contractor's use. Not all locations will have the same color. Custom colors will be required.
- C. Interior Locations: Sealants specified in Section 07 9200.
- D. Exterior Locations:
 - 1. Joints which are bordered by glass: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
 - a. Color: Custom color for joints between exterior Precast Architectural Concrete Specialties.
 - 2. Joints which are bordered by plastic: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 - 3. Horizontal joints in concrete decks, concrete floors: Exterior or Interior Horizontal Expansion Joint Sealant - Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component. Types specified in 07 9200.
 - a. Where sealant is shown on the Drawings for concrete slabs.
 - b. Where decks or floors abut structural slabs or stoops.
 - c. Where decks or floors abut exterior wall of buildings.
 - d. Parking garage decks and slabs.
 - 4. Membrane Roofing Sealants: Types recommended by roofing manufacturer and complying with requirements of this section.
 - 5. Steep Slope Roofing Sealants: Types recommended by roofing manufacturer and complying with requirements of this section. Sheet Metal and Roof Accessory Sealants:

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Types recommended by roofing manufacturer and complying with requirements of this section.

7. Horizontal Joints in paving on grade, driveways and similar: Types specified in Division 32
 - a. At walk expansion joints.
 - b. Where walks abut structural slabs or stoops.
 - c. Where walks abut exterior wall of buildings.
 - d. Asphalt and other paving.
8. All other exterior joints:
 - a. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 - b. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
 - c. Around perimeters of frames where door, window and louver frames abut concrete, masonry or other building materials (interior and exterior).
 - d. Expansion and control joints in masonry walls (interior and exterior).
 - e. Masonry at dissimilar material or at dissimilar masonry.
 - f. Sills and thresholds.
 - g. At miscellaneous locations where sealant is shown on Drawings.

E. General:

1. Joints in construction between interior and exterior spaces and other designated or required locations to provide effective barrier against passage of elements:
 - a. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT. .
2. Specialty perimeters where required for appearance or weather tightness:
 - a. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT. .
 - b. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT. .

- END OF SECTION -

- SECTION 07 9500 -**INTERIOR EXPANSION CONTROL**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Joint systems for parking garage interiors
 - a. Floors: Exterior type seismic joint covers between existing parking garage (Parkade) floor curb and new exterior building wall
 - 1) Joint size shall be fabricated to accommodate existing joint width at each floor level of existing Parkade Parking Garage which vary.
 - 2) Joint cover shall be custom fabricated to size where cover will extend onto existing concrete curb, but not hang over edge.
 - 3) Joint cover shall be custom shaped to fit against vertical sheet metal seismic joint covers.
 - 4) Refer to A9.7 and 22/A9.7
 - b. Floors: Exterior type seismic joint covers between existing parking garage (Parkade) floors and new exterior building wall
 - 1) Joint size shall be fabricated to accommodate existing joint width at each floor level of existing Parkade Parking Garage which vary.
 - 2) Joint cover shall be custom shaped to fit against vertical sheet metal seismic joint covers.
 - 3) Refer to A9.7 and 22/A9.7

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- D. Section 03 3000 "Cast-in-Place Concrete" for cast-in architectural-joint-system frames furnished, but not installed, in this Section.

- E. Section 07 8446 "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
- F. Section 07 9200 "Joint Sealants" for joint sealants at interior of building
- G. Section 07 9523 "Exterior Expansion Control" for exterior expansion joints including the joint between existing Parkade, Parking Garage roof and Hotel exterior wall.
- H. Section 09 2900 "Gypsum Board".
- I. Division 9 applied flooring sections.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- D. Manufacturer's recommendations and specifications.

1.5 DEFINITIONS

- A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.
- D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:

1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings: Provide the following for each joint system specified:
 1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
 2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - a. Manufacturer and model number for each joint system.
 - b. Joint system location cross-referenced to Drawings.
 - c. Nominal joint width.
 - d. Movement capability.
 - e. Classification as thermal or seismic.
 - f. Materials, colors, and finishes.
 - g. Product options.
 - h. Fire-resistance ratings.
- F. Samples for Verification: For each type of architectural joint system indicated.
 1. To be viewed on composite mock-up.
- G. Closeout Submittals:
 1. Submit under provisions of Section 01 7700 "Closeout Procedures".
 2. Warranty: Submit specified warranty.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain interior architectural joint systems through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated.
 1. Refer to Division 1 Section "Product Requirements."
- C. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)".

- E. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

1.9 COORDINATION

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.
- C. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 - 2. Component Importance Factor is 1.0.

2.2 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

2.3 MATERIALS

- A. Aluminum: **ASTM B 221** (**ASTM B 221M**), Alloy 6063-T5 for extrusions; **ASTM B 209** (**ASTM B 209M**), Alloy 6063-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
- B. Stainless Steel: SS316 - ASTM A 240/A 240M, Type 316 for plates, sheet, and strips.
 1. Remove tool and die marks and stretch lines or blend into finish.
 - C. Brass: CZ108 - ASTM B 36/B 36M, UNS Alloy C26000 for half hard sheet and coil.
 - D. Bronze: ASTM B 455, Alloy C38500 for extrusions; Alloy C23000 red brass for plates.
 - E. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.
 - F. Compression Seals: ASTM E 1612; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.
 - G. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
 - H. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
 - I. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.
 - J. Moisture Barrier: Flexible elastomeric material,
 1. EPDM: 30 mils thick, min.
 2. PVC: 40 mils thick, min.
 3. Santoprene.
 - K. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
 - L. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.
 - M. Strip Seals: ASTM E 1783; preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.
 - N. Extruded Preformed Seals: Single or multi-layered rubber extrusions as classified under ASTM D2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer's standard colors.
 - O. Exterior Seals: Typically two single layered flexible extrusions, one interior PVC and one exterior Santoprene 8000 series non-hydroscopic, thermoplastic rubber, as classified under ASTM D2000, retained in a set of compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer's standard colors.

- P. Centering Bars, where applicable on systems 4-inch and larger, shall have semi-spheres which engage in the frame.
- Q. Spring Clips, where applicable in 2-inch systems.

2.4 ARCHITECTURAL JOINT SYSTEMS, GENERAL

- A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
- B. Design architectural joint systems for the following size and movement characteristics:
 - 1. Nominal Joint Width: As indicated on Drawings, 3-inches minimum.
 - 2. Movement Capability: 25 percent, +75%. unless otherwise noted.
 - 3. Type of Movement: Seismic.

2.5 FABRICATION

- A. General – Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated.
 - 1. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement.
 - 2. Furnish units in longest practicable lengths to minimize number of end joints.
 - 3. Provide hairline-mitered corners where joint changes directions or abuts other materials.
 - 4. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections and other accessories as required to provide continuous joint cover assemblies.

2.6 [PARKING GARAGE AND OPEN-AIR STRUCTURE EXPANSION CONTROL SYSTEMS]

- A. Basis-of-Design Product: **In-Pro Corporation, JOINTMASTER Expansion Joint Systems**, www.inprocorp.com and subject to compliance with requirements, provide the products specified in individual subparagraphs below as basis-of-design products or a comparable single source mfr. product by one of the following:
 - 1. Balco, Inc.
 - 2. C/S Group.
 - 3. MM Systems Corporation.
 - 4. Nystrom, Inc.
- B. **Floor curb to Wall Roof Joint Systems: (rectangular curb)**
 - 1. Basis-of-Design Products: as manufactured by In-Pro Corporation.
 - a. Series: 600 Roof Systems
 - b. Models: **691-A02**- Custom width if opening exceeds 12 -inches and sized to accommodate varied gap dimensions.

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- c. Joint system shall be capable of +/- 50 percent seismic movement.
- d. Application:
 - 1) 5th. Level (Uppermost level below roof) of existing Parkade, Parking Garage to new Hotel exterior wall.
 - 2) Where indicated on Drawings.
- 2. Assembly:
 - a. Custom fabricated to meet existing field verified joint widths which vary.
 - b. Continuous aluminum surface mount frame with continuous vinyl gasket for mounting to rectangular curb.
 - c. Continuous aluminum plate cover
- 3. Options:
 - a. Vapor/Moisture Barrier: Manufacturer's standard.
 - 1) 30 mils thick EPDM or approved material by assembly manufacturer.

C. Floor to Wall Joint Systems for slab edge or curb to wall:

- 1. Basis-of-Design Products: as manufactured by In-Pro Corporation.
 - a. Series: 400 Roof Systems
 - b. Models: 401C-A02- Custom width and sized to accommodate varied gap dimensions.
 - c. Joint system shall be capable of +/- 50 percent seismic movement.
 - d. Application:
 - 1) Ground floor, 2nd., 3rd. and 4th. Levels of existing Parkade, Parking Garage
 - 2) Where indicated on Drawings.
- 2. Assembly:
 - a. Continuous aluminum Wall Angle mounted below cover plate.
 - b. Continuous aluminum cover plate custom fabricated to meet existing field verified joint widths which vary.
 - c. Continuous aluminum plate cover shall be fabricated at curb conditions to not hang over the outside edge of existing curb.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work:
 - 1. Noticeable variations in same piece are not acceptable.
 - 2. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 FINISHES

A. Anodized Aluminum

1. Color: (To be selected by Architect from the following)
 - a. Clear
 - b. Champagne
 - c. Light bronze
 - d. Medium bronze
 - e. Dark bronze
 - f. Extra Dark Bronze
 - g. Black
2. Standards:
 - a. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 - b. Clear Anodic Finish: AAMA 611, alloy 6063-T6, AA-M12C22A41, Class I, 0.018 mm or AA-M12C22A31, Class II, 0.010 mm or thicker.

B. Kynar Coatings

1. Color: (To be selected by Architect from the following)
 - a. Match Architect's sample or
 - b. As selected by Architect from full range of manufacturers Premier or standard coating options.
2. Standard:
 - a. High-Performance Organic Finish (Kynar): Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

C. Seals – Sanoprene:

1. Color: (To be selected by Architect from the following)
 - a. Bright White
 - b. Off White
 - c. Beige
 - d. Gray
 - e. Black

2.9 ACCESSORIES

- ### A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary cover.
1. Drain-Tube Assemblies: Equip moisture barrier with drain tubes and seals to direct collected moisture to drain and/or to exterior-wall expansion control system as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.
- C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
- D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
 - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 4. Locate in continuous contact with adjacent surfaces.
 - 5. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3-inches (75 mm) from each end and not more than 24-inches (600 mm) o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both frame interfaces before installing compression seals.
- E. Foam Seals: Install with adhesive recommended by manufacturer.
- F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not over pressurize.
- G. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
- H. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- I. Water Barrier: Provide water barrier at joints exposed to weather or where called for on Drawings. Provide drainage fittings at a maximum of 50-feet (15.2 m) or where indicated.
- J. Vapor / Moisture Barrier: Provide vapor / moisture water barrier at all interior
 - 1. Install in accordance with assembly manufacturer's written instructions

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete.
 - 1. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections.
 - 1. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints.
 - 2. Reinstall cover plates or seals prior to Substantial Completion of the Work.

- END OF SECTION -

- SECTION 07 9523 -**EXTERIOR EXPANSION CONTROL**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Architectural joint systems for building exteriors.
 - a. Coordination and integration with sheet metal fabricated vertical joint covers between existing and new building.
 - 1) Refer also to Section 07 6200.
 - 2) Refer to A9.7.
 - b. Roof: Exterior rain shedding seismic joint covers between existing parking garage (Parkade) metal deck roof and new exterior building wall.
 - 1) Joint cover shall be custom fabricated for field verified joint width which varies.
 - 2) Joint cover shall turn down over the vertical joint cover at walls for water shedding and watertight assembly.
 - 3) Joint shall be custom fabricated with leg of aluminum frame sized to accommodate existing metal deck profile.
 - 4) Refer to the following, but not limited to; A9.7 and 24/A9.7

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 03 3000 "Cast-in-Place Concrete" for cast-in architectural-joint-system frames furnished, but not installed, in this Section.
- D. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal wall joint systems including vertical joints between the new building Hotel and existing building, Parkade Parking Garage.

- E. Section 07 8446 "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
- F. Section 07 9213 "Exterior Facade Joint Sealants" for exterior building skin sealants.
- G. Section 07 9500 "Interior Expansion Control" for interior expansion joints including ones between existing Parkade, Parking Garage and Hotel exterior wall..

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- D. Manufacturer's recommendations and specifications.

1.5 DEFINITIONS

- A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.
- D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings: Provide the following for each joint system specified:

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1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, breakout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - a. Manufacturer and model number for each joint system.
 - b. Joint system location cross-referenced to Drawings.
 - c. Nominal joint width.
 - d. Movement capability.
 - e. Classification as thermal or seismic.
 - f. Materials, colors, and finishes.
 - g. Product options.
 - h. Fire-resistance ratings.

- F. Samples for Verification: For each type of architectural joint system indicated.
1. To be viewed on composite mock-up.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

1.8 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700 "Closeout Procedures".
- B. Warranty: Submit specified warranty.

1.9 QUALITY ASSURANCE

- A. Source Limitations: Obtain Exterior architectural joint systems through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated.
1. Refer to Division 1 Section "Product Requirements."
- C. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)".

- E. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

1.10 COORDINATION

- A. Coordinate installation of exterior wall and soffit joint systems with roof expansion assemblies to ensure that wall transitions are watertight. Roof expansion assemblies are specified in Division 7.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.
- C. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 - 2. Component Importance Factor is 1.0.

2.2 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.
- B. Coordination:
 - 1. Coordinate installation of exterior expansion joints with interior wall expansion control systems.

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2. Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.3 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING EXTERIORS

- A. Basis-of-Design Product: **JointMaster, a division of InPro Corporation, www.inprocorp.com** as specified and subject to compliance with requirements, provide the products specified in individual subparagraphs below as basis-of-design products or a comparable product by one of the following:
 1. Balco, Inc., www.balcousa.com
 2. Construction Specialties, Inc., www.c-sgroup.com
 3. MM Systems Corporation, www.mmstsemcorp.com
 4. Nystrom, Inc., www.nystrom.com
- B. **Roof to Wall Roof Joint Systems: (sloped existing roof decking at Parkade, Parking Garage)**
 1. Basis-of-Design Products: as manufactured by In-Pro Corporation.
 - a. Series: 600 Roof Systems
 - b. Models: **661-A02**- Custom width if opening exceeds **12 -inches** and sized to accommodate varied gap dimensions.
 - c. Joint system shall be capable of **+/- 50 percent** seismic movement.
 - d. Application:
 - 1) Roof Level of existing Parkade, Parking Garage to new Hotel exterior wall.
 - 2) Where indicated on Drawings.
 2. Assembly:
 - a. Custom fabricated to meet existing field verified joint widths which vary.
 - b. Continuous aluminum surface mount frame with continuous vinyl gasket for mounting to tapered curb.
 - c. Aluminum frame shall be custom fabricated with leg length to align with existing roof decking profile.
 - d. Continuous aluminum plate cover.
 - e. Continuous aluminum plate cover shall be fabricated with return leg of **10 -inches** to extend down the face of the vertical sheet metal joint covers..
 3. Options:
 - a. Vapor/Moisture Barrier: Manufacturer's standard.
 - 1) **30 mils** thick EPDM or approved material by assembly manufacturer.

2.4 MATERIALS

- A. Aluminum: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5 for extrusions; **ASTM B 209 (ASTM B 209M)**, Alloy 6063-T6 for sheet and plate.
 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
 2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

- B. Stainless Steel: SS316 - ASTM A 240/A 240M , Type 316 for plates, sheet, and strips.
 - 1. Remove tool and die marks and stretch lines or blend into finish.
- C. Brass: CZ108 - ASTM B 36/B 36M, UNS Alloy C26000 for half hard sheet and coil.
- D. Bronze: ASTM B 455, Alloy C38500 for extrusions; Alloy C23000 red brass for plates.
- E. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.
- F. Compression Seals: ASTM E 1612; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.
- G. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- H. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
- I. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.
- J. Moisture Barrier: Flexible elastomeric material,
 - 1. EPDM: 30 mils thick, min.
 - 2. PVC: 40 mils thick, min.
 - 3. Santoprene.
- K. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- L. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.
- M. Strip Seals: ASTM E 1783; preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.
- N. Extruded Preformed Seals: Single or multi-layered rubber extrusions as classified under ASTM D2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer's standard colors.
- O. Exterior Seals: Typically two single layered flexible extrusions, one interior PVC and one exterior Santoprene non-hydroscopic, thermoplastic rubber, as classified under ASTM D2000, retained in a set of compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer's standard colors.
- P. Centering Bars, where applicable on systems 4-inch and larger, shall have semi-spheres which engage in the frame.
- Q. Spring Clips, where applicable in 2-inch systems.

EXTERIOR EXPANSION CONTROL

2.5 ARCHITECTURAL JOINT SYSTEMS, GENERAL

- A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
- B. Design architectural joint systems for the following size and movement characteristics:
 - 1. Nominal Joint Width: As indicated on Drawings, **3 -inches** minimum.
 - 2. Movement Capability: **25 percent, +75 percent** unless otherwise noted.
 - 3. Type of Movement: Seismic.

2.6 FABRICATION

- A. General – Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated.
 - 1. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement.
 - 2. Furnish units in longest practicable lengths to minimize number of end joints.
 - 3. Provide hairline-mitered corners where joint changes directions or abuts other materials.
 - 4. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections and other accessories as required to provide continuous joint cover assemblies.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work:
 - 1. Noticeable variations in same piece are not acceptable.
 - 2. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 FINISHES

- A. Anodized Aluminum
 - 1. Color: (To be selected by Architect from the following)
 - a. Mill
 - b. Anodized:
 - 1) Clear

- 2) Champagne
 - 3) Light bronze
 - 4) Medium bronze
 - 5) Dark bronze
 - 6) Extra Dark Bronze
 - 7) Black
 - 2. Standards:
 - a. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 - b. Clear Anodic Finish: AAMA 611, alloy 6063-T6, AA-M12C22A41, Class I, 0.018 mm or AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Kynar Coatings
- 1. Color: (To be selected by Architect from the following)
 - a. Match Architect's sample or
 - b. As selected by Architect from full range of manufacturers Premier or standard coating options.
 - 2. Standard:
 - a. High-Performance Organic Finish (Kynar): Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- C. Seals – Sanoprene:
- 1. Color: (To be selected by Architect from the following)
 - a. Bright White
 - b. Off White
 - c. Beige
 - d. Gray
 - e. Black
- D. Stainless steel
- 1. Finish: As selected by Architect from the following;
 - a. 2B mill finish
 - 1) Smooth, reflective grey sheen
 - b. 2R mill finish
 - 1) Smooth, highly reflective grey sheen

2.9 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary cover.

1. Drain-Tube Assemblies: Equip moisture barrier with drain tubes and seals to direct collected moisture to drain and/or to exterior-wall expansion control system as indicated on Drawings

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.
- C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
- D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.
 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 4. Locate in continuous contact with adjacent surfaces.
 5. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
 6. Locate anchors at interval recommended by manufacturer, but not less than 3-inches (75 mm) from each end and not more than 24-inches (600 mm) o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 1. Provide in continuous lengths for straight sections.

2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both frame interfaces before installing compression seals.
- E. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not over pressurize.
- F. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
- G. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- H. Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings at a maximum of 50-feet (15.2 m) or where indicated.
- I. Vapor / Moisture Barrier: Provide vapor / moisture water barrier at all Vapor / Moisture Barrier: Provide vapor / moisture water barrier at all systems exposed to weather.
1. Install in accordance with assembly manufacturer's written instructions.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete.
1. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections.
1. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints.
 2. Reinstall cover plates or seals prior to Substantial Completion of the Work.

- END OF SECTION -

DIVISION 08 – OPENINGS

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- SECTION 08 1113 -**HOLLOW METAL DOORS AND FRAMES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior Hollow Metal Doors and Frames
 - 2. Exterior Hollow Metal Doors and Frames

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 07 9200 "Joint Sealants".
- D. Section 07 9213 "Exterior Facade Joint Sealants".
- E. Section 08 1400 "Wood Doors".
- F. Section 08 7100 "Door Hardware".
- G. Section 08 8000 "Interior Glazing".
- H. Section 08 8013 "Exterior Glazing".
- I. Section 09 9113 "Exterior Painting".
- J. Section 09 9123 "Interior Painting".
- K. Section 09 9123.13 "Paint Schedule".
- L. Section 09 9600 "High-Performance Coatings" for preparing, priming and painting of all exterior conditions and where indicated on Drawings.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- C. [ASTM International \(ASTM\)](#) Publications:
 - 1. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".
 - 2. A568 "Standard Specification for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled".
 - 3. A591 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".
 - 4. A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".
 - 5. A924 "Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process".
 - 6. A1008 "Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability".
 - 7. A1011 "Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability".
 - 8. E90 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".
 - 9. E2074 "Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies".
- D. [American National Standards Institute \(ANSI\)](#) Publications:
 - 1. ANSI/SDI A250.3 "Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames".
 - 2. ANSI/SDI A250.4 "Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings".
 - 3. ANSI/SDI A250.6 "Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames".
 - 4. ANSI/SDI A250.8 - SDI-100 "Recommended Specifications for Standard Steel Doors and Frames".
 - 5. ANSI/SDI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames".
 - 6. ANSI/SDI A250.11 "Recommended Erection Instructions for Steel Frames (Formerly SDI-105)".
 - 7. [ANSI/DHI](#) Publications:
 - a. DHI A115.1G "Installation Guide for Doors and Hardware".
- E. Commercial Standards
 - 1. CS-242-62.
- F. [National Association of Architectural Metal Manufacturers \(NAAMM\)](#) Publications:
 - 1. "Metal Finishes Manual for Architectural and Metal Products".
- G. [National Fire Protection Association \(NFPA\)](#) Publications:

HOLLOW METAL DOORS AND FRAMES

1. NFPA 80 "Standard for Fire Doors and Windows".
2. NFPA 105 "Hot Smoke Test".
3. NFPA 252 "Standard Methods of Fire Tests of Door Assemblies".

H. [National Association of Architectural Metal Manufacturers \(NAAMM\)](#) Publications:

1. "Metal Finishes Manual for Architectural and Metal Products".

I. [Steel Door Institute \(SDI\)](#) Publications:

1. SDI 105 through 128.

J. [Underwriter's Laboratories, Inc. \(UL\)](#) Standards:

1. UL Building Materials Directory; Underwriters Laboratories Inc.
2. UL 10B "Standard for Fire Tests of Door Assemblies".
3. UL 10C "Positive Pressure Fire Tests of Door Assemblies".
4. UL 1784 "Air Leakage Tests of Door Assemblies".
5. Procedure No. R-3791.
6. Procedure No. R-3821.

K. [Warnock Hersey, ETL SEMKO division of Intertek \(WHI\)](#) Publications:

1. "Certification Listings".

1.5 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in [ANSI](#) A250.8, are minimums as defined in referenced [ASTM](#) standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.

1. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature-rise ratings, and finishes for each type of steel door and frame specified.
2. Submit Shop Drawings and product data indicating pertinent dimensioning, construction, component connections and locations, anchorage methods and locations, hardware locations and installation details, and the following:
 - a. Elevations of each door design.
 - b. Details of doors including vertical and horizontal edge details.
 - c. Frame details for each frame type including dimensioned profiles.
 - d. Details and locations of reinforcement and preparations for hardware.
 - e. Details of each different wall opening condition.
 - f. Details of anchorages, accessories, joints, and connections.
 - g. Coordination of glazing frames and stops with glass and glazing requirements.
3. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 - a. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.7 QUALITY ASSURANCE

- A. Hollow metal doors and frames shall be fabricated in accordance with standards and specifications established by Steel Door Institute, complying with [ANSI](#) A250.8-1998 ([SDI](#)-100) "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Acoustical qualities: Doors shall have a minimum sound transmission classification of 29 as tested under [ASTM](#) E90 61T.
- C. Fire-Rated Door Assemblies: Units that comply with [NFPA](#) 80 are identical to door and frame assemblies tested for fire-test-response characteristics per [ASTM](#) E2074, and are labeled and listed by [UL](#), [Warnock Hersey](#), or another testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated. Test pressure shall be tested in accordance with [NFPA](#) 252, or [UL](#) 10C to comply with local code requirements.
- D. Opening assemblies shall meet the requirements of [NFPA](#) 105 Hot Smoke Test.
- E. All stairwell doors and other doors as may be shown on the Drawings shall comply with the temperature-rise rating of **450 degrees F.** maximum in 30 minutes of fire exposure.
- F. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.
 1. Certificate: When requested, submit certificate indicating qualification.
- G. Inspection: General Contractor shall provide in writing to Owner an inspection of all steel doors and frames for conformance to specifications. Inspection shall include checking for fit tolerance plumb and level as well as proper hardware and operation.
- H. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E152

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"Standard Methods of Fire Tests of Door Assemblies" by nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

1. Oversize Fire-Rated Door Assemblies: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, provide certificate or label from approved independent testing and inspection agency, indicating that door and frame assembly conforms to requirements of design, materials and construction as established by individual listings for tested assemblies.
- I. Fire-Rated, Borrowed Light Frame Assemblies: Assemblies complying with [NFPA 80](#) that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to [NFPA 257](#), or [UL 9](#).

1.8 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000. Deliver hollow metal work cardboard wrapped or crated to provide protection during transit and job storage.
 1. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
 2. Deliver welded frames with two removable spreader bars across bottom of frames.
- B. Label each item, before shipping, with metal or plastic tags to show their location, size, door swing, and other pertinent information.
- C. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect.
 1. Remove and replace damaged items that cannot be repaired as directed.
- D. Store doors and frames at building site under cover.
 1. Place units on minimum **4-inch** high wood blocking.
 2. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately.
 3. Provide minimum **1/4-inch** spaces between stacked doors to permit air circulation.

1.10 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) recommended by manufacturer for optimum results. Do not install products environmental conditions outside manufacturer's absolute limits.

1.11 COORDINATION

- A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 DISTRIBUTOR

- A. Avendra, LLC Preferred Manufacturers:
 - 1. Contract Hardware, Inc. (404-350-9408)
 - a. Contact: Mark Tew

2.3 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. The Steelcraft Door and Frame Products, Division of Ingersoll-Rand (800-930.8585)
 - 2. Ceco Door Products, an ASSA ABLOY Group Company (615-661-5030)
 - 3. Republic Builders Products, Division of MAGNATRAX Corporation (800-733-3667)
 - 4. CURRIES Company, an ASSA ABLOY Group Company (800-377-3948)

2.4 MATERIALS

- A. Hot-Rolled Steel Sheets: [ASTM](#) A1011 and A568, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

- B. Cold-Rolled Steel Sheets [ASTM](#) A1008 and A568, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Electrolytic Zinc-Coated Steel Sheet: [ASTM](#) A591, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.
- D. Hot dipped zinc coated steel shall be of the alloyed type and comply with [ASTM](#) A924 and A653.
- E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to [ASTM](#) A153, Class B.
- F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to [ASTM](#) A153.
- G. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- I. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or [SSPC](#) Paint 20.
- J. Hardware reinforcing on doors and frames shall comply with [ANSI/SDI](#) A250.6. The physical performance levels shall be in accordance with [ANSI/SDI](#) A250.4.
 - 1. All Exterior Door Frames, Public Space, Back-of-House, and Guest Room Entry Door Frames: Continuously welded corners.
 - a. Exception: Prefinished Frames (Timely or Rediframe) are acceptable for panelized construction ONLY.
 - 2. Interior Guestroom Door Frames: Continuously welded corners.
 - 3. Hollow Metal "Knock-Down" Type door frames are not permitted.

2.5 HOLLOW METAL FRAMES

- A. General:
 - 1. Fabricate steel frame units to comply with [ANSI/SDI](#) A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Conceal fastenings, unless otherwise indicated.
- B. Location and Type:
 - 1. All metal frames for doors shall be formed of steel to sizes and shapes indicated.
 - 2. Frames shall be fabricated with continuously welded corners unit type construction at joints .
 - 3. Frames shall be furnished with [Underwriter's Laboratories](#) label, as required, at the place of manufacturer.

- C. Type and Gauges of Metal: Metal for frames shall be cold-rolled or hot-rolled, pickled and oiled, steel sheets with clean, smooth surfaces. Except where other gauges are indicated or specified, frames shall be fabricated from steel, not lighter than the standard Manufacturers Standard Gauge (MSG) as referenced in [ANSI A250.8](#) :
1. Interior Frames of 16-gauge (0.053-inch) thick steel sheet for:
 - a. Door openings wider than 48 -inches.
 - b. Level 2 steel doors.
 - c. Wood doors, unless otherwise indicated.
 2. Exterior Frames of 16-gauge (0.053-inch) thick steel sheet for:
 - a. All doors.
 3. Exterior frames shall be 0.30 per square foot per side, hot-dipped galvanized or electrolytic zinc-coated steel with a stretcher level degree of flatness.
- D. Workmanship and Design: The finished work shall be strong and rigid, neat in appearance, and free from defects. Fabricate members straight and true with corner joints well-formed, in true alignment and fastenings concealed where practicable.
- E. Drywall Frames:
1. Drywall frames shall be the same as flush frames except:
 2. Frames shall be formed with double return backbends to prevent cutting into drywall surface. Frames shall be knocked down, designed to be securely installed in the rough opening after wallboard is applied. Mitered corners shall be reinforced with a wedge lock corner clip to provide a firm interlock of jambs to head.
 3. Each jamb shall have an adjustable anchor located 4 -inch from the top of the door opening to hold frame in rigid alignment. Frames shall have a welded-in base anchor attaching plate in each jamb for field installation of loose base anchors or frames shall have two (2) dimpled holes in each jamb for anchoring base of frame with screws.
- F. Forming Corner Joints: Joints for welded-type frames shall be mitered and continuously arc-welded for full depth and width of frame and trim. All contact edges shall be closed tight and all welds on exposed surfaces dressed smooth and flush.
- G. Provision for Hardware: Frames shall be prepared at the factory for the installation of hardware. Comply with applicable requirements in [ANSI A250.6](#) and [ANSI A115](#) Series specifications for door and frame preparation for hardware, unless more stringent requirements are indicated. Welding of hinges to frames will not be permitted. Frames shall be mortised, reinforced, drilled, and tapped to templates to receive all mortised hardware. Provide cover boxes in back of all hardware cut-outs. Lock strikes shall be set out and adjusted to provide clearance for silencers.
1. Provide preparation for rubber silencers on interior room door frames; three per strike jamb at single doors.
 2. Provide concealed metal reinforcements for hardware as required. The gauges of metal for reinforcement shall be in accordance with the manufacturer's recommendations for the type of hardware and the thickness and width of doors to be hung in the frame, provided that the gauges used are not lighter than those required by Commercial Standard CS-242-62.
 - a. Galvanized for exterior doors.
 3. All frames shall have a security anchor system installed on strike jamb consisting of a compression anchor at 3-1/2 -inch from head of door frame and a "Z" type security anchor at 45 -inches above floor.

- H. Wall Anchors: Provide metal anchors of shapes and sizes required for the adjoining type of wall construction. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24 -inches apart. Galvanized anchors for exterior frames.
 - 1. Anchor types shall be varied to provide positive fastening to adjacent construction.
 - 2. Provide UL approved anchors for UL labeled frames. Anchorage of UL label frames shall conform to printed UL test report for door frame manufactured.
- I. Plaster Guards: Provide 0.016-inch thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
 - 1. Required at all door strikes.
- J. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
- K. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- L. Floor Anchors: Provide floor clips of not less than 16-gauge steel and fasten to bottom of each jamb member for anchoring frame to floor construction.
 - 1. Clips shall be adjustable and drilled for 3/8 -inch diameter anchor bolts.
- M. Shipment: For welded type frames, provide temporary steel spreaders fastened across bottom of frames. Where construction will permit concealment, leave spreaders in place after installation. Otherwise, remove spreaders after frames are set and anchored. In place of spreaders, frames may be strapped together in pairs with heads inverted for bracing during shipment. Before shipping, label each frame with metal or plastic tapes to show their location, size, door swing, and other pertinent information.
 - 1. All Exterior Door Frames, Public Space, Back-of-House, and Guest Room Entry Door Frames: Continuously welded corners.

2.6 PREFINISHED FRAMES (PF)

- A. Manufacturers:
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
- B. Approved Manufacturers:
 - 1. "C-Series Frames"; Timely Industries, Inc. (800-247-6242)
 - 2. Rediframe Products Division, Dunbarton Corporation, Inc. (800-633-7553)
- C. Materials:
 - 1. Frame: Provide minimum 18 gauge, cold-rolled steel sheet conforming to ASTM A366.
 - 3. Fasteners: Types and sizes specified in manufacturer's installation instructions for project conditions.
 - 4. Workmanship and Design: The finished work shall be strong and rigid, neat in appearance, and free from defects. Fabricate members straight and true with corner joints well-formed, in true alignment and fastenings concealed where practicable.
 - 5. Provision for Hardware: Frames shall be prepared at the factory for the installation of hardware. Welding of hinges to frames will not be permitted. Frames shall be mortised,

- reinforced, drilled, and tapped to templates to receive all mortised hardware. Provide cover boxes in back of all hardware cut-outs. Lock strikes shall be set out and adjusted to provide clearance for silencers.
- a. Provide preparation for rubber silencers on interior room door frames; three per strike jamb at single doors.
 - b. Provide concealed metal reinforcements for hardware as required. The gauges of metal for reinforcement shall be in accordance with the manufacturer's recommendations for the type of hardware and the thickness and width of doors to be hung in the frame, provided that the gauges used are not lighter than those required by Commercial Standard CS-242-62.
 - c. All frames shall have a security anchor system installed on strike jamb
 - 1) Provide safeguard at strike to prevent entry by prying.
6. Wall Anchors: Provide metal anchors of shapes and sizes required for the adjoining type of wall construction. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24 -inches apart. Anchor the frame to the wall with fasteners every 11-inches around the perimeter of the frame.
- a. Anchor types shall be varied to provide positive fastening to adjacent construction.
7. Provide UL approved anchors for UL labeled frames. Anchorage of UL label frames shall conform to printed UL test report for door frame manufactured.
8. Finishes:
- a. Factory-Applied Paint Finish: Manufacturer's standard, factory-applied baked enamel paint finish complying with ANSI A250.3 for performance and acceptance criteria.
 - 1) Color: Standard color to match color as shown on Interior Finish Index.

2.7 FRAME INSULATION

- A. Fully grout all exterior frames.
- B. Glass fiber, semi-rigid board, 2 -inch thickness, unfaced, 3 lb. density.
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. "Type 703" - Owens-Corning Fiberglass Corp (800-438-7465)
 - b. Substitutions: None accepted

2.8 HOLLOW METAL DOORS

- A. General:
1. Fabricate steel door units to comply with ANSI/SDI A250.8. and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Hollow Metal Doors:
1. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8. for level and model and ANSI/SDI A250.4 for physical-endurance level.

HOLLOW METAL DOORS AND FRAMES

2. Interior Flush Door:
 - a. Model: "L Series"; Steelcraft Manufacturing Company, or approved substitution by other listed manufacturers.
 - b. Level 2, Heavy Duty, 18-gage, and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
 - c. Thickness: 1-3/4 -inch
 - d. Cores: Per [ANSI/SDI](#) A250.8
 - 1) Doors shall be reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and honeycomb core.
 - e. Minimum hardware reinforcing gages shall comply with Table 4 of [ANSI/SDI](#) A250.8.
3. Interior Temperature Rise Doors
 - a. Temperature rise doors shall be the same as flush door construction except core material shall be designed to produce the 450 degree temperature rise rating.
 - b. Cores: Per [ANSI/SDI](#) A250.8:
 - c. Mineral-Fiber Board: For labeled doors if a temperature-rise limit is required.
4. Exterior Doors: Provide doors complying with requirements indicated below by referencing [ANSI/SDI](#) A250.8 for level and model and [ANSI/SDI](#) A250.4 for physical-endurance level:
 - a. Flush Door:
 - 1) Thickness: 1-3/4 -inch
 - 2) Model: "L Series"; Steelcraft Manufacturing Company, or approved substitution by other listed manufacturers.
 - 3) Level 3, Extra Heavy Duty, 16-gage, and Physical Performance Level B (Extra Heavy Duty), Model 2 (Seamless).
 - b. Exterior doors shall be fabricated as thermal insulating door and frame assemblies and tested in accordance with [ASTM](#) C236 or [ASTM](#) C976 on fully operable door assemblies. Provide thermal-rated assemblies with U-factor of 0.24 or better. Hot-dipped galvanized or electrolytic zinc-coated steel with a stretcher level degree of flatness.
 - c. All exterior doors shall have the top and bottoms closed to eliminate moisture penetration.
 - 1) Door tops shall not have holes or openings.

C. Door Louvers:

1. Furnish and install louvers for interior doors, where indicated, that comply with [SDI](#) 111C, with blades or baffles formed of 0.020-inch thick, cold-rolled steel sheet set into 0.032-inch thick steel frame.
 - a. Provide stationary sight-proof louvers with inverted V-Shaped or Y-Shaped blades of sizes and locations as shown on the Drawings.
 - b. Provide Fire-Rated Automatic Louvers of sizes and locations as shown on the Drawings at fire-rated openings.
 - 1) Louvers to be constructed with movable blades closed by actuating fusible links and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by the same testing and inspecting agency that established fire-resistance rating of door assembly.

D. Door Fabrication:

1. Fabricate doors and frames in accordance with [ANSI/SDI](#) A250.8.
2. Workmanship: The finished work shall be rigid, neat in appearance, and free from defects; form molding members straight and true with joints coped or mitered, well formed and in true alignment. All welded joints on exposed surfaces shall be dressed smooth so they are invisible after finishing.
3. Door Sizes and Clearances: Doors shall be of type, sizes, and design indicated. The clearances for doors shall be **1/8 -inch** at jambs and heads and **3/4 -inch** at bottom, unless indicated or specified otherwise. Clearances at meeting edges of pairs of doors shall be **1/4 -inch** (**1/8 -inch** on fire doors).
 - a. Clearances for Fire-Rated Doors: As required by [ANSI/NFPA](#) 80.
4. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
5. Provisions for Hardware: Mortise, reinforce, drill, and tap doors at factory to receive all mortise-type hardware. Provide reinforcing only for doors to receive surface-applied hardware, except push plates and kick plates; drilling and tapping for surface-applied hardware will be done in the field. Provide metal reinforcing plates for surface-applied hardware as required. The gauges of metal for reinforcing plates shall comply with manufacturer's recommendation for the type of hardware used and the size and thickness of doors, provided that the minimum requirements are as follows:
 - a. Hinge Reinforcement: **3/16 -inch**
 - b. Strike Reinforcement: **11 Gauge**
 - c. Closers and Bracket Reinforcement: **12 Gauge**
 - d. Mortise Covers: **26 Gauge**
 - e. The gauges used shall not be lighter than those required by Commercial Standard CS 242-62.
6. Glazing Preparation:
 - a. Doors indicated to have glass shall have non-removable glazing stops on the exterior sides of the openings and removable or snap-on type stops on the inside of the openings.
 - b. Provide manufacturer's vision lites of sizes and locations as shown on Drawings, recessed into the door face similar to "Dezigner Trim" by Steelcraft, or approved substitution by listed manufacturers.
 - c. Stops shall be [UL](#) approved for [UL](#) labeled doors.

E. Doors with labels shall carry Underwriters label on the door and on the frame.

1. They shall be constructed to meet Procedure No. R-3791 and R-3821, as listed by [Underwriters Laboratories](#).

2.9 FINISHES

- A. General: Comply with [NAAMM](#)'s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 1. Finish steel doors and frames after assembly.
- B. Factory Prime Coating for Field Painted Finish: Unless specified otherwise, provide manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with [ANSI/SDI](#) A250.10 for acceptance criteria.

HOLLOW METAL DOORS AND FRAMES

1. Clean and chemically treat metal surfaces to assure maximum paint adherence. Follow with a dip or spray coat of lead-free, rust-inhibitive metallic oxide, zinc chromate, or synthetic resin primer on all exposed surfaces. Finished surfaces shall be smooth and free from irregularities and rough spots.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.
 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.

3.2 GENERAL

- A. Fabricate and install hollow metal units and their accessories in strict accordance with these Specifications and manufacturer's data.
- B. Hardware: For installation see Division 08, "Door Hardware" Section of these Specifications.

3.3 PLACING FRAMES

- A. Comply with the provisions of the "[Steel Door Institute](#)" 105, unless otherwise indicated.
- B. Set frames accurately in position, plumbed, aligned, and braced until permanent anchors are set.
 1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
- C. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
- D. Concrete Walls: Solidly fill space between frames and concrete with grout.
 1. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces
- E. Frame Insulation: Install insulation in frames of gypsum board partitions. Cut insulation to full width of frame throat and friction fit within the jamb and head. Pack solid around perimeter of the frame.
- F. Anchor bottom of frames to floors with expansion bolts, or with power fasteners. Build wall anchors into walls or secure to adjoining construction as indicated or specified. Where frames require ceiling struts or other structural overhead bracing, they shall be anchored securely to ceiling or structural framing above as indicated and specified.

1. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
2. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
3. For openings **90 -inches** or more in height, install an additional anchor at hinge and strike jambs.

G. Install fire-rated frames in accordance with [NFPA](#) Standard No. 80.

3.4 DOOR INSTALLATION

- A. Door Installation: Comply with [ANSI](#) A250.8. Fit hollow metal doors accurately in their respective frames within clearances specified in [ANSI](#) A250.8. Shim as necessary to comply with [SDI](#) 122 and [ANSI](#)/DHI A115.1G .
- B. Place fire-rated doors with clearances as specified in [NFPA](#) Standard No. 80.
- C. Smoke-Control Doors: Install to comply with [NFPA](#) 105.

3.5 ADJUSTMENT

- A. Check and re-adjust operating finish hardware items in hollow metal work just prior to final inspection.
- B. Remove and replace defective work including doors or frames which are warped, bowed, or otherwise damaged.
- C. Finished Doors: Refinish or replace doors damaged during installation.
- D. Protect doors as recommended by door manufacturer to ensure that doors will be without damage or deterioration at time of Substantial Completion.

3.6 TOUCH-UP

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Repairs: Fill surface depressions with metallic paste filler, allow to cure, and sand flush for invisible joint with adjacent metal surfaces. Sand rust areas and apply touch-up paint using air drying paints compatible with shop finish. Damaged doors or frames that cannot be repaired shall be replaced.

3.7 CLEANING:

- A. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.

HOLLOW METAL DOORS AND FRAMES

- C. Upon completion, metal surfaces of doors and frames that are completely factory finished shall be thoroughly cleaned and touched-up as recommended by the door manufacturer.

- END OF SECTION -

- SECTION 08 1400 -

WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid Core Wood Doors with Plastic Laminate Veneer Faces
 - a. Solid Core Flush Doors at Public Space Doors and Back-of-House Doors.
 - b. Solid Core Flush Doors at Courtyard Guestroom Entry.
 - c. Solid Core Flush Doors at Courtyard Bathroom.
 - d. Solid Core Flush Doors at Courtyard Closets.
 - 2. Solid Core Wood Veneer Doors.
 - 3. Stile and Rail Doors.
 - 4. Solid Core Wood Doors with Wood Veneer Faces:
 - a. Typical for Residence Inn.
 - b. Guestroom Corridor doors:
 - 1) See Plastic laminate as option for Architects possible selection and approval.
 - 5. Solid Core Wood Doors with Plastic Laminate Veneer Faces:
 - a. Solid Core Bathroom Sliding Barn Doors at Residence Inn Guestrooms.
 - 6. Option for Stained Wood Veneer Guestroom Corridor doors as selected by Architect.
 - a. Where indicated on Drawings.
 - 7. Wood Frames: Pre-Finished Wood Frames (Option).

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 1053 "Miscellaneous Rough Carpentry".
- C. Section 06 2000b.01 "Finish Carpentry" (Courtyard)
- D. Section 06 2000b.02 "Finish Carpentry" (Residence Inn)

- E. Section 08 1113 "Hollow Metal Doors and Frames".
- F. Section 08 3819 "Impact Traffic Doors" for Kitchen access doors
- G. Section 08 4113 "Aluminum Framed Entrances and Storefronts".
- H. Section 08 7100 "Door Hardware".
- I. Section 08 8000 "Interior Glazing".
- J. Section 09 9123 "Interior Painting".
- K. Section 09 9123.13 "Paint Schedule".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- C. [Window and Door Manufacturers Association \(WDMA\)](#) Publications:
 - 1. I.S.1-A "Architectural Wood Flush Doors".
 - 2. I.S.6, "Industry Standard for Wood Stile and Rail Doors".
- D. [Architectural Woodwork Institute \(AWI\)](#) Publications:
 - 1. "Architectural Woodwork Quality Standards".
- E. [American National Standards Institute \(ANSI\)](#) Publications:
 - 1. ANSI/AHA A135.4 "Basic Hardboard".
 - 2. ANSI 208.1 "Standards for the Performance of Particleboard".
 - 3. ANSI Z97.1 "Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings".
- F. [ASTM International \(ASTM\)](#) Publications:
 - 1. C920 "Standard Specification for Elastomeric Joint Sealants".
 - 2. C1036 "Standard Specification for Flat Glass".
- G. [Door and Hardware Institute \(DHI\)](#) Publications:
 - 1. DHI-WDHS-3 "Recommended Hardware Locations for Wood Flush Doors".
 - 2. DHI A115 "Steel Door Preparation Standards".
- H. [National Fire Protection Association \(NFPA\)](#) Publications:
 - 1. NFPA 80 "Standard for Fire Doors, Fire Windows".
- I. [Underwriter's Laboratories, Inc. \(UL\)](#) Standards
 - 1. UL 10B "Standard for Fire Tests of Door Assemblies".
 - 2. UL 10C "Positive Pressure Fire Tests of Door Assemblies".

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
 - 1. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
 - 2. Shop Drawings: Submit Shop Drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
 - a. Submittals shall use the same designations for door and hardware numbers as shown on the Drawings.

1.6 QUALITY ASSURANCE

- A. Quality Standards: Comply with the following standards:
 - 1. [WDMA](#) Quality Standard: I.S.1-A "Architectural Wood Flush Doors", and I.S.6, "Industry Standard for Wood Stile and Rail Doors" of [Window and Door Manufacturers Association \(WDMA\)](#).
 - 2. [AWI](#) Quality Standard: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Wood Flush Doors", and Section 100-S-3 "Moisture Content", of [Architectural Woodwork Institute \(AWI\)](#) for grade of door, core construction, finish and other requirements exceeding those of [WDMA](#) quality standard.
- B. Sound Transmission Class: All entrance doors from interior corridors, together with their perimeter seals shall have a minimum Sound Transmission Class (STC) of [\[26\]](#).
- C. Safety Glass: Provide products complying with [ANSI](#) Z97.1 and testing requirements of 16 [CFR](#), Part 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.
- D. Fire-Rated Wood Doors: Provide wood doors that comply with [NFPA](#) 80, are identical in materials and construction to units tested in door and frame assemblies per [ASTM](#) E152, and

which are labeled and listed for ratings indicated by [Underwriters Laboratory \(UL\)](#), [Warnock Hersey, ETL SEMKO division of Intertek \(WHI\)](#), or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Provide rated stiles on fire rated doors.
 2. Comply with the requirements of the International Building Code with testing in accordance with [UL](#) 10C for positive pressure door test.
 - a. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 -inches or less above the sill.
 - b. Doors shall be labeled to certify compliance.
 - c. Provide installation instructions attached to each door in a manner that assures availability to the installer and building official.
- E. Manufacturer: Obtain doors from one source.
- F. Inspection: General Contractor shall provide in writing to [Architect](#), an inspection of all doors and frames for conformance to specifications. Inspection shall include checking for fit tolerance, plumb and level, as well as proper hardware and operation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of [WDMA](#) pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.
1. Individually Package doors in vented poly bags with identifying marks prior to shipment. Doors shall not be removed from bags until ready to hang. After hanging, bags shall be placed over doors to provide protection until area in which doors are hung is free of construction traffic.
 2. Store doors off the floor at least 3 -inches in an area that is not susceptible to standing water or high moisture. Store doors in an upright position with spacers or corner caps separating each door.
- C. Identify each door with individual opening numbers which correlate with designation system used on Shop Drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.8 PROJECT CONDITIONS

- A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to Project's geographical location:
1. Referenced [AWI](#) quality standard including Section 100-S-11, "Relative Humidity and Moisture Content".

1.9 WARRANTY

- A. General: Warranties shall be in addition to and run concurrent with, and not be a limitation of, other rights the Owner may have under the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer and General Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) more than 1/4 -inch in a 42 -inch by 84 -inch section, or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 -inch span, or do not conform to tolerance limitations of referenced quality standards.
 - 1. Warranty shall also include reinstallation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 - 2. Warranty shall be in effect during the following period after date of Substantial Completion:
 - 3. Solid-Core Interior Doors: Life of installation.
 - 4. Solid Core Exterior Wood Doors: **Two (2) years** from date of Substantial Completion.
- C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's Warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers primers and coatings. Comply with limits specified in Section 01 6116.

2.2 DISTRIBUTORS

- A. Avendra, LLC Preferred Distributor:
 - 1. Contract Hardware, Inc. (800-266-3418)
 - a. Contact: Mark Tew

2.3 PLASTIC FACED WOOD DOORS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. Flush Doors
 - a. None
- B. Approved Manufacturers:
 - 1. Flush Doors
 - a. [VT Industries Inc.](#) (800-827-1615)
 - b. [Mohawk Flush Doors, Inc.](#), a Masonite Company (570-473-3557)
 - c. [Eggers Industries](#) (920-793-1351)
 - d. [Marshfield DoorSystems, Inc.](#) (800-369-3667)

- C. Solid Core Doors for Laminate Finish: Comply with the following requirements:
1. Faces:
 - a. Plastic Laminate: NEMA LD-3, General Purpose 0.050 -inch HPDL, Grade 50. Melamine doors are not acceptable.
 - b. Color and pattern as shown on Interior Finish Index. Allow different selections as indicated.
 2. AWI Grade: Custom
 3. Construction: 3-Ply
 4. Core: Solid Core Doors: Particleboard, ANSI/208.1, 1-LD-2
 5. Thickness: 1-3/4 -inch.
 6. Factory seal top and bottom rails.
 7. Facing Adhesive: Type I - Water-proof.
 8. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors as follows:
 - a. Top Rail (No Closer): Minimum 1-1/8 -inch.
 - b. Top Rail (Closer): Minimum 5-inch remaining after installation. Verify with closer manufacturer.
 - c. Bottom Rail: Minimum 1-1/8 -inch after undercut.
 - d. Bottom Rail: 5-inch bottom-rail in doors indicated to have kick, mop, or armor plates.
 - e. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices, at location of exit device.
 9. Stiles: Hardwood or structural composite lumber, minimum 1-3/8-inch wide before sanding. Plastic-laminate matching faces, applied before faces.
- D. Fire-Rated Solid Core Laminate Doors: Comply with the following requirements.
1. Faces: Provide faces to match non-rated doors in same area of building, unless otherwise indicated.
 - a. Construction: Manufacturer's core construction as required to provide fire-resistance rating indicated.
 2. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors or as required to meet specified fire rating and as follows:
 - a. Top Rail (No Closer): Minimum 1-1/8 -inch.
 - b. Top Rail (Closer): Minimum 5 -inch remaining after installation. Verify with closer manufacturer.
 - c. Bottom Rail: Minimum 1-1/8 -inch after undercut.
 - d. Bottom Rail: 5 -inch bottom-rail in doors indicated to have kick, mop, or armor plates.
 - e. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices at location of exit device.
 3. Stiles: Provide stiles consisting of two plies.
 - a. The inner-ply shall be minimum 1-3/8 -inches Structural Composite Lumber (SCL) or approved non-combustible material on 20 minute rated doors, On 45, 60, and 90 minute rated doors, the inner-ply shall be 1 -inch of Structural Composite lumber or approved combustible material.

- b. Pairs: Provide fire-rated pairs with fire-retardant stiles matching plastic laminate that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.
 - 1) Provide stiles with concealed intumescent seals where available by manufacturer.
- c. Provide edge construction with intumescent seals concealed by outer stile matching plastic laminate in accordance with "Category A" Guidelines as published by ITS/Warnock Hersey, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
 - 1) Intumescent seals shall not be exposed on the vertical edges of the door.
 - 2) Surface applied intumescent seals will not be permitted on the door or frame.

2.4 INTERIOR FLUSH WOOD DOORS

- A. Manufacturers:
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. [VT Industries Inc.](#) (800-827-1615)
 - b. [Mohawk Flush Doors, Inc.](#), a Masonite Company (570-473-3557)
 - c. [Eggers Industries](#) (920-793-1351)
 - d. [Marshfield DoorSystems, Inc.](#) (800-369-3667)
- B. Solid Core Doors for Transparent Finish: Comply with the following requirements:
 - 1. Faces: [ANSI](#)/HPVA A Grade, Pair and Book-Matched for uniform color and grain pattern.
 - a. Wood Veneer: Select, Plain Sliced White Birch.
 - 2. AWI Grade: Custom.
 - 3. Construction: 5-Ply
 - a. Solid Core Doors: Particleboard, ANSI/208.1, 1-LD-2
 - 4. Thickness: 1-3/4 -inch
 - 5. Factory seal top and bottom rails.
- C. Blocking: Provide either hardwood or Structural Composite Lumber (SCL) wood blocking in particleboard-core doors as follows:
 - 1. Top Rail (No Closer): Minimum 1-1/8 inch.
 - 2. Top Rail (Closer): Minimum 5-inch with remaining after installation, or as required to provide proper blocking surface mounted hardware to avoid through-bolts and maintain warranty. Verify with closer manufacturer.
 - 3. Bottom Rail: Minimum 1-1/8 inch after undercut; 5-inch bottom-rail in doors indicated to have kick, mop, or armor plates.
 - 4. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices at location of exit device.
 - 5. Stiles: Provide stiles consisting of two plys.
 - a. The inner ply shall be minimum 1-1/8 inches of hardwood or LSL engineered lumber.
 - b. The outer ply shall be of hardwood lumber of the same species as the face veneer.

- c. Bond stiles and rails to core, then sand entire unit prior to applying crossbanding and face veneers
- D. Fire-Rated Solid Core Doors: Comply with the following requirements.
 - 1. Faces and [AWI](#) Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.
 - a. Construction: Manufacturer's core construction as required to provide fire-resistance rating indicated.
 - 2. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors or as required to meet specified fire rating and as follows:
 - a. Top Rail (No Closer): Minimum 1-1/8 inch.
 - b. Top Rail (Closer): Minimum 5-inch with remaining after installation, or as required to provide proper blocking surface mounted hardware to avoid through-bolts and maintain warranty. Verify with closer manufacturer.
 - c. Bottom Rail: Minimum 1-1/8 inch after undercut.
 - d. Bottom Rail: 5-inch bottom-rail in doors indicated to have kick, mop, or armor plates.
 - e. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices at location of exit device.
 - 3. Stiles: Provide stiles consisting of two plies.
 - a. The inner-ply shall be minimum 1-1/8 inches Structural Composite Lumber (SCL) or approved non-combustible material on 20 minute rated doors, On 45, 60, and 90 minute rated doors, the inner-ply shall be 1-inch of Structural Composite lumber or approved combustible material.
 - b. The outer ply shall be of hardwood lumber the same species as the face veneer with.
 - 1) Veneer tape will not be permitted.
 - c. Provide edge construction with intumescent seals concealed by outer stile matching face veneer in accordance with "Category A" Guidelines as published by ITS/Warnock Hersey, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
 - 1) Intumescent seals shall not be exposed on the vertical edges of the door.
 - 2) Surface applied intumescent seals will not be permitted on the door or frame.
 - d. Bond stiles and rails to core, then sand entire unit prior to applying crossbanding and face veneers.
 - e. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.
 - 1) Provide stiles with concealed intumescent seals.

2.5 INTERIOR STILE AND RAIL WOOD DOORS

- A. Manufacturers:
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:

- a. [VT Industries Inc.](#) (800-827-1615)
 - b. [Mohawk Flush Doors, Inc.](#), a Masonite Company (570-473-3557)
 - c. [Eggers Industries](#) (920-793-1351)
 - d. [Marshfield DoorSystems, Inc.](#) (800-369-3667)
- B. Interior Stile and Rail Wood Doors: Interior custom doors complying with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards," and with other requirements specified.
 - 1. Wood Species and Cut for Transparent Finish:
 - a. Refer to Article "Interior Flush Wood Doors".
 - 2. Door Construction for Transparent Finish:
 - a. Stile and Rail Construction: Veneered, structural composite lumber or veneered, edge- and end-glued clear lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces. Use veneers not less than 1/8 inch (3.2 mm) thick.
 - 3. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction: Veneered, structural composite lumber or veneered edge- and end-glued lumber.
 - 4. Stile and Rail Widths: Manufacturer's standard, to match the following:
 - a. Stiles, Top and Intermediate Rails: 6inches (153 mm).
 - b. Bottom Rails: 10 inches (305 mm).
 - 5. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
 - 6. Glass: Ceramic-coated tempered float glass with ceramic enamel applied by silk-screened process and complying with ASTM C 1048, Condition C (other coated glass), Type I (transparent flat glass), Quality-Q3, Specification No. 95-1-31 in GANA Tempering Division's "Engineering Standards Manual," and other requirements specified.
 - a. Thickness: 3/8 inch (9.525 mm).
 - b. Screen: Frosted.
 - 7. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

2.6 LOUVERS AND LIGHT FRAMES

- A. Wood Louvers (except at full louver doors): Door manufacturer's standard solid-wood louvers, unless otherwise indicated. Size as indicated on Mechanical Drawings.
- B. Fire Door Louvers: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire rating of one and one-half hours and less. Size as indicated on Mechanical Drawings.
 - 1. Metal and Finish: Galvanized steel, 0.0396 -inch thick, hot-dip zinc coated and factory primed for paint finish.
- C. Wood Beads for Light Openings in Wood Doors:
 - 1. Wood Species: Same species as door faces, painted to match laminate at laminate doors.
 - 2. Profile: Flush rectangular beads.
 - 3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

- D. Wood-Veneered Beads for Light Openings in Fire Doors: At fire-rated door locations except, 20-minute rated doors, provide manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.
- E. Refer to Section 08 8000 "Interior Glazing" for glazing.

2.1 PRE-FINISHED WOOD FRAMES

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. "Profile LWM 493"; [Teton Sales Co., LLC](#) (208-459-6334)
 - 2. Approved Substitution
- C. Finish to match prefinished doors.

2.2 FABRICATION - GENERAL

- A. Fabricate wood doors to produce doors complying with following requirements:
 - 1. Fabricate fire rated doors in accordance with [AWI](#) Quality Standards and to [UL](#) or [Warnock Hersey, ETL SEMKO division of Intertek \(WHI\)](#) requirements. Attach fire rating label to door and frame.
 - 2. Stiles, rails and core shall be fully bonded together with adhesive and sanded smooth prior to laminating of face veneer.
 - 3. Cross bands and faces for PC and FD type doors shall be laminated to core by the hot or cold plate process.
 - 4. Solid Core Doors for Laminate Finish:
 - a. Vertical Exposed Edge of Stiles: Plastic laminate same as door facing.
 - b. Laminate edge to be applied before the face laminate.
 - 5. Factory-prefit and pre-machine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory pre-machining.
 - b. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in [NFPA](#) 80 for fire-rated doors.
 - c. Locate hardware to comply with [DHI](#)-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, [DHI](#) A115-W series standards, and hardware templates.
 - d. Factory drill pilot holes for hinge and lock face plate screws.
 - e. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory pre-machining.
 - 6. Undercut:
 - a. Guestroom Entry Door = 1/4 -inch above threshold.
 - b. Guestroom Connector = 1/2 -inch above threshold as coordinated with door bottom. (15/16 -inch above concrete)
 - c. Guest Bathroom Door = 3/8 -inch above threshold.

- d. Doors swinging over carpet = 3/4 -inch above top of concrete subfloor.
- B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Louvers: Factory install louvers in prepared openings.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.
- D. Pre-Assembled Doors and Frames:
 - 1. Coordinate with Section 08 7100 for all hardware requirements, including installation.

2.3 SHOP PRIMING

- A. Doors for Transparent (Stained) Finish: (Where indicated on Drawings)
 - 1. Shop seal faces and edge of doors, including cutouts, with stain (if required), other required pretreatments, and first coat of finish as specified in Section 09 9123 "Interior Painting". and Section 09 9300 "Staining & Transparent Finishing".
- B. Doors for Opaque (Painted) Finish:
 - 1. Shop prime faces and edges of doors, including cutouts, with two coat of wood primer specified in Section 09 9123 "Interior Painting".
 - a. Match primer-sealer color to color of finish coats; refer to Finish Index on Drawings for paint color.
 - b. Refer to Section 09 9123.13 "Interior Paint Schedule".
 - c. Includes the following doors unless indicated otherwise on Drawings:
 - 1) Guest Bathroom doors
 - 2) Guest Closet doors

2.4 FACTORY FINISHING

- A. Laminate plastic finish.
 - 1. As shown on Interior Finish Index.
- B. Transparent (Stain) Finish: (Where indicated on Drawings)
 - 1. Factory-applied by Manufacturer following [AWI](#) Section 1500 requirements for Custom Grade "TR-6". Finish shall consist of a four-coat process with a minimum 3-mil dry film thickness on all surfaces.
 - a. Apply vinyl wash coat by spray or roller; fully pad into surfaces and wipe off.
 - b. Apply stain by spray or roller; fully pad surfaces and wipe off.
 - c. Sand lightly using 220-grit paper.
 - d. Apply final finish of two coats of clear, transparent, catalyzed vinyl resin by spray or roller.
 - e. Stain Color: Satin-finish stain in color as approved by the Marriott Representative to match a finished stain sample in color as shown on Interior Finish Index.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames prior to hanging door.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation see Section 08 71 00 "Door Hardware".
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and of referenced [AWI](#) standard and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of [NFPA](#) No. 80.
- C. Job-Fit Doors:
 - 1. Field-verify dimensions of each new installed door frame; trim each door as required to properly fit each frame within specified dimensional tolerances; unequal trimming may be required.
 - 2. Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and matching.
 - a. Trim non-rated doors equally from both sides when fitting for width and from top and bottom when fitting for height. Do not trim more than 3/4 -inch from each edge.
 - 3. Fitting Clearances for Non-Rated Doors: Provide 1/8 -inch at jambs and heads; 1/16 -inch per leaf at meeting stiles for pairs of doors; and 1/8 -inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 -inch clearance from bottom of door to top of threshold.
 - 4. Fitting Clearances for Fire-Rated Doors: Complying with [NFPA](#) 80.
 - 5. Bevel non-rated doors 1/8 -inch in 2 -inch at lock and hinge edges.
 - 6. Bevel fire-rated doors 1/8 -inch in 2 -inch at lock edge, trim stiles and rails only to extent permitted by labeling agency.
- D. Hang doors and adjust for proper clearances and smooth operation without binding.
 - 1. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
 - 2. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- E. Field-Finished Doors: Refer to the following for finishing requirements:
 - 1. Section 09 9123 "Interior Painting".and Section 09 9300 "Staining & Transparent Finishing".

2. Seal field cuts in top and bottom rails and for hardware with 2 coats of a VOC compliant paint or varnish.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Operation: Rehang or replace doors which do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Clean door and dry wipe with a soft cloth.
- D. Clean glazing using cleaning compounds that will not damage glass, door finishes or adjacent materials.
- E. After installation, protect doors from damage as recommended by manufacturer during subsequent construction activities. Damaged doors will be rejected and shall be replaced at no additional cost to Owner.

- END OF SECTION -

- SECTION 08 1400.02 -**WOOD DOORS (RESIDENCE INN)**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: (RESIDENCE INN)
1. Types of doors required include the following:
 - a. Solid Core Wood Doors with Wood Veneer Faces:
 - 1) Typical for Residence Inn.
 - 2) Guestroom Corridor doors:
 - a) See Plastic laminate as option for Architects possible selection and approval.
 - b. Solid Core Wood Doors with Plastic Laminate Veneer Faces:
 - 1) Solid Core Bathroom Sliding Barn Doors at Guestrooms.
 - 2) Option for Stained Wood Veneer Guestroom Corridor doors as selected by Architect.
 - 3) Where indicated on Drawings.
 2. Types of Wood Frames required include the following:
 - a. Pre-Finished Wood Frames (Option)

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 06 1053 "Miscellaneous Rough Carpentry".
- D. Section 06 2000.01 "Finish Carpentry" (Courtyard)
- E. Section 06 2000.02 "Finish Carpentry" (Residence Inn)
- F. Section 08 1400.01 "Wood Doors" (Courtyard, Public Spaces and Back of House)
- G. Section 08 1113 "Hollow Metal Doors and Frames".

- H. Section 08 4113 "Aluminum Framed Entrances and Storefronts".
- I. Section 08 7100 "Door Hardware".
- J. Section 08 8000 "Interior Glazing".
- K. Section 09 9123 "Interior Painting".
- L. Section 09 9123.13 "Paint Schedule".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- C. [Window and Door Manufacturers Association \(WDMA\)](#) Publications:
 - 1. I.S.1-A "Architectural Wood Flush Doors"
 - 2. I.S.6, "Industry Standard for Wood Stile and Rail Doors"
- D. [Architectural Woodwork Institute \(AWI\)](#) Publications:
 - 1. "Architectural Woodwork Quality Standards"
- E. [American National Standards Institute \(ANSI\)](#) Publications:
 - 1. ANSI/AHA A135.4 "Basic Hardboard"
 - 2. ANSI 208.1 "Standards for the Performance of Particleboard"
 - 3. ANSI Z97.1 "Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings"
- F. [ASTM International \(ASTM\)](#) Publications:
 - 1. C920 "Standard Specification for Elastomeric Joint Sealants"
 - 2. C1036 "Standard Specification for Flat Glass"
- G. [Door and Hardware Institute \(DHI\)](#) Publications:
 - 1. DHI-WDHS-3 "Recommended Hardware Locations for Wood Flush Doors"
 - 2. DHI A115 "Steel Door Preparation Standards"
- H. [National Fire Protection Association \(NFPA\)](#) Publications:
 - 1. NFPA 80 "Standard for Fire Doors, Fire Windows"
- I. [Underwriter's Laboratories, Inc. \(UL\)](#) Standards
 - 1. UL 10B "Standard for Fire Tests of Door Assemblies"
 - 2. UL 10C "Positive Pressure Fire Tests of Door Assemblies"

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
 - 1. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
 - 2. Shop Drawings: Submit Shop Drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
 - a. Submittals shall use the same designations for door and hardware numbers as shown on the Drawings.

1.6 QUALITY ASSURANCE

- A. Quality Standards: Comply with the following standards:
 - 1. [WDMA](#) Quality Standard: I.S.1-A "Architectural Wood Flush Doors", and I.S.6, "Industry Standard for Wood Stile and Rail Doors" of [Window and Door Manufacturers Association \(WDMA\)](#).
 - 2. [AWI](#) Quality Standard: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors", and Section 100-S-3 "Moisture Content", of [Architectural Woodwork Institute \(AWI\)](#) for grade of door, core construction, finish and other requirements exceeding those of [WDMA](#) quality standard.
- B. Sound Transmission Class: All entrance doors from interior corridors, together with their perimeter seals shall have a minimum Sound Transmission Class (STC) of [26].
- C. Safety Glass: Provide products complying with [ANSI](#) Z97.1 and testing requirements of 16 [CFR](#), Part 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

- D. Fire-Rated Wood Doors: Provide wood doors that comply with [NFPA 80](#), are identical in materials and construction to units tested in door and frame assemblies per [ASTM E152](#), and which are labeled and listed for ratings indicated by [Underwriters Laboratory \(UL\)](#), [Warnock Hersey](#), [ETL SEMKO division of Intertek \(WHI\)](#), or other testing and inspection agency acceptable to authorities having jurisdiction.
1. Provide rated stiles on fire rated doors.
 2. Comply with the requirements of the International Building Code with testing in accordance with [UL 10C](#) for positive pressure door test.
 - a. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
 - b. Doors shall be labeled to certify compliance.
 - c. Provide installation instructions attached to each door in a manner that assures availability to the installer and building official.
- E. Manufacturer: Obtain doors from one source.
- F. Inspection: General Contractor shall provide in writing to [Architect and Owner's Representative](#), an inspection of all doors and frames for conformance to specifications. Inspection shall include checking for fit tolerance, plumb and level, as well as proper hardware and operation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of [WDMA](#) pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.
1. Individually Package doors in vented poly bags with identifying marks prior to shipment. Doors shall not be removed from bags until ready to hang. After hanging, bags shall be placed over doors to provide protection until area in which doors are hung is free of construction traffic.
 2. Store doors off the floor at least 3" in an area that is not susceptible to standing water or high moisture. Store doors in an upright position with spacers or corner caps separating each door.
- B. Identify each door with individual opening numbers which correlate with designation system used on Shop Drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.8 PROJECT CONDITIONS

- A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to Project's geographical location:
1. Referenced [AWI](#) quality standard including Section 100-S-11, "Relative Humidity and Moisture Content".

1.9 WARRANTY

- A. General: Warranties shall be in addition to and run concurrent with, and not be a limitation of, other rights the Owner may have under the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer and General Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) more than **1/4 -inch** in a **42 -inch** by **84 -inch** section, or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a **3 -inch** span, or do not conform to tolerance limitations of referenced quality standards.
 - 1. Warranty shall also include reinstallation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 - 2. Warranty shall be in effect during the following period after date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of installation.
 - b. Solid Core Exterior Wood Doors: **Two (2) years** from date of Substantial Completion.
- C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's Warranty.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 DISTRIBUTORS

- A. Avendra, LLC Preferred Distributor:
 - 1. Contract Hardware, Inc. (800-266-3418)
 - a. Contact: Mark Tew

2.3 INTERIOR FLUSH WOOD DOORS

- A. Manufacturers:
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. [VT Industries Inc.](#) (800-827-1615)
 - b. [Mohawk Flush Doors, Inc.](#), a Masonite Company (570-473-3557)
 - c. [Eggers Industries](#) (920-793-1351)
 - d. [Marshfield DoorSystems, Inc.](#) (800-369-3667)

- B. Solid Core Doors for Transparent Finish: Comply with the following requirements:
1. Faces: [ANSI](#)/HPVA A Grade, Pair and Book-Matched for uniform color and grain pattern.
 - a. Wood Veneer: Select, Plain Sliced White Birch
 2. AWI Grade: Custom
 3. Construction: 5-Ply
 - a. Solid Core Doors: Particleboard, ANSI/208.1, 1-LD-2
 4. Thickness: [1-3/4 -inch](#)
 5. Factory seal top and bottom rails.
- C. Blocking: Provide either hardwood or Structural Composite Lumber (SCL) wood blocking in particleboard-core doors as follows:
1. Top Rail (No Closer): Minimum [1-1/8 inch](#).
 2. Top Rail (Closer): Minimum [5-inch](#) with remaining after installation, or as required to provide proper blocking surface mounted hardware to avoid through-bolts and maintain warranty. Verify with closer manufacturer.
 3. Bottom Rail: Minimum [1-1/8 inch](#) after undercut; [5-inch](#) bottom-rail in doors indicated to have kick, mop, or armor plates.
 4. Midrail: [5-inch](#) midrail blocking, in doors indicated to have exit devices at location of exit device.
 5. Stiles: Provide stiles consisting of two plys.
 - a. The inner ply shall be minimum [1-1/8 inches](#) of hardwood or LSL engineered lumber.
 - b. The outer ply shall be of hardwood lumber of the same species as the face veneer.
 - c. Bond stiles and rails to core, then sand entire unit prior to applying crossbanding and face veneers
- D. Fire-Rated Solid Core Doors: Comply with the following requirements.
1. Faces and [AWI](#) Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.
 - a. Construction: Manufacturer's core construction as required to provide fire-resistance rating indicated.
 2. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors or as required to meet specified fire rating and as follows:
 - a. Top Rail (No Closer): Minimum [1-1/8 inch](#).
 - b. Top Rail (Closer): Minimum [5-inch](#) with remaining after installation, or as required to provide proper blocking surface mounted hardware to avoid through-bolts and maintain warranty. Verify with closer manufacturer.
 - c. Bottom Rail: Minimum [1-1/8 inch](#) after undercut.
 - d. Bottom Rail: [5-inch](#) bottom-rail in doors indicated to have kick, mop, or armor plates.
 - e. Midrail: [5-inch](#) midrail blocking, in doors indicated to have exit devices at location of exit device.
 3. Stiles: Provide stiles consisting of two plys.
 - a. The inner-ply shall be minimum [1-1/8 inches](#) Structural Composite Lumber (SCL) or approved non-combustible material on 20 minute rated doors, On 45, 60, and 90 minute rated doors, the inner-ply shall be [1-inch](#) of Structural Composite lumber or approved combustible material.

- b. The outer ply shall be of hardwood lumber the same species as the face veneer with.
 - 1) Veneer tape will not be permitted.
- c. Provide edge construction with intumescent seals concealed by outer stile matching face veneer in accordance with "Category A" Guidelines as published by ITS/Warnock Hersey, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
 - 1) Intumescent seals shall not be exposed on the vertical edges of the door.
 - 2) Surface applied intumescent seals will not be permitted on the door or frame.
- d. Bond stiles and rails to core, then sand entire unit prior to applying crossbanding and face veneers.
- e. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.
 - 1) Provide stiles with concealed intumescent seals.

2.4 PLASTIC FACED WOOD DOORS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. Flush Doors
 - a. None
- B. Approved Manufacturers:
 - 1. Flush Doors
 - a. [VT Industries Inc.](#) (800-827-1615)
 - b. [Mohawk Flush Doors, Inc.](#), a Masonite Company (570-473-3557)
 - c. [Eggers Industries](#) (920-793-1351)
 - d. [Marshfield DoorSystems, Inc.](#) (800-369-3667)
- C. Solid Core Doors for Laminate Finish: Comply with the following requirements:
 - 1. Faces:
 - a. Plastic Laminate: NEMA LD-3, General Purpose 0.050 -inch HPDL, Grade 50, color and pattern as shown on Interior Finish Index. Melamine doors are not acceptable.
 - 1) Wilsonart Plastic Laminate, Loft Oak #7968K-12 (PL-2)
 - a) Confirm with Architect.
 - 2. AWI Grade: Custom
 - 3. Construction: 3-Ply
 - 4. Core:
 - a. Solid Core Doors: Particleboard, ANSI/208.1, 1-LD-2
 - 5. Thickness: 1-3/4 -inch
 - 6. Facing Adhesive: Type I - Water-proof.
 - 7. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors as follows:
 - a. Top Rail (No Closer): Minimum 1-1/8 -inch.

- b. Top Rail (Closer): Minimum 5-inch remaining after installation. Verify with closer manufacturer.
 - c. Bottom Rail: Minimum 1-1/8 -inch after undercut.
 - d. Bottom Rail: 5-inch bottom-rail in doors indicated to have kick, mop, or armor plates.
 - e. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices devices at location of exit device.
 - 8. Stiles: Hardwood or structural composite lumber, minimum 1-3/8 -inch wide before sanding. Plastic-laminate matching faces, applied before faces.
- D. Fire-Rated Solid Core Laminate Doors: Comply with the following requirements.
- 1. Faces: Provide faces to match non-rated doors in same area of building, unless otherwise indicated.
 - a. Construction: Manufacturer's core construction as required to provide fire-resistance rating indicated.
 - 2. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors or as required to meet specified fire rating and as follows:
 - a. Top Rail (No Closer): Minimum 1-1/8 -inch.
 - b. Top Rail (Closer): Minimum 5 -inch remaining after installation. Verify with closer manufacturer.
 - c. Bottom Rail: Minimum 1-1/8 -inch after undercut.
 - d. Bottom Rail: 5 -inch bottom-rail in doors indicated to have kick, mop, or armor plates.
 - e. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices at location of exit device.
 - 3. Stiles: Provide stiles consisting of two plys.
 - a. The inner-ply shall be minimum 1-3/8 -inches Structural Composite Lumber (SCL) or approved non-combustible material on 20 minute rated doors, On 45, 60, and 90 minute rated doors, the inner-ply shall be 1 -inch of Structural Composite lumber or approved combustible material.
 - b. Pairs: Provide fire-rated pairs with fire-retardant stiles matching plastic laminate that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.
 - 1) Provide stiles with concealed intumescent seals where available by manufacturer.
 - c. Provide edge construction with intumescent seals concealed by outer stile matching plastic laminate in accordance with "Category A" Guidelines as published by ITS/Warnock Hersey, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
 - 1) Intumescent seals shall not be exposed on the vertical edges of the door.
 - 2) Surface applied intumescent seals will not be permitted on the door or frame.

2.5 LOUVERS AND LIGHT FRAMES

- A. Wood Louvers (except at full louver doors): Door manufacturer's standard solid-wood louvers, unless otherwise indicated. Size as indicated on Mechanical Drawings.
- B. Fire Door Louvers: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire rating of one and one-half hours and less. Size as indicated on Mechanical Drawings.
 - 1. Metal and Finish: Galvanized steel, 0.0396 inch thick, hot-dip zinc coated and factory primed for paint finish.
- C. Wood Beads for Light Openings in Wood Doors:
 - 1. Wood Species: Same species as door faces, painted to match laminate at laminate doors.
 - 2. Profile: Flush rectangular beads.
 - 3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.
- D. Wood-Veneered Beads for Light Openings in Fire Doors: At fire-rated door locations except, 20-minute rated doors, provide manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.
- E. Refer to Section 08 8000 for glazing.

2.6 PRE-FINISHED WOOD FRAMES

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. "Profile LWM 493"; [Teton Sales Co., LLC](#) (208-459-6334)
 - 2. Approved Substitution
- C. Finish to match prefinished doors.

2.7 FABRICATION - GENERAL

- A. Fabricate wood doors to produce doors complying with following requirements:
 - 1. Fabricate fire rated doors in accordance with [AWI](#) Quality Standards and to UL or Warnock Hersey requirements. Attach fire rating label to door and frame.
 - 2. Stiles, rails and core shall be fully bonded together with adhesive and sanded smooth prior to laminating of face veneer.
 - 3. Cross bands and faces for PC and FD type doors shall be laminated to core by the hot or cold plate process.
 - 4. Solid Core Doors for Laminate Finish:
 - a. Vertical Exposed Edge of Stiles: Plastic laminate same as door facing.
 - b. Laminate edge to be applied before the face laminate.

5. Factory-prefit and pre-machine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory pre-machining.
 - b. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in [NFPA](#) 80 for fire-rated doors.
 - c. Locate hardware to comply with Door and Hardware Institute ([DHI](#)) DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, [DHI](#) A115-W series standards, and hardware templates.
 - d. Factory drill pilot holes for hinge and lock face plate screws.
 - e. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory pre-machining.
6. Undercut:
 - a. Guestroom Entry Door = $\frac{1}{4}$ -inch above threshold.
 - b. Guestroom Connector = $\frac{1}{2}$ -inch above threshold as coordinated with door bottom. ($\frac{15}{16}$ " above concrete)
 - c. Guest Bathroom Door = $\frac{3}{8}$ -inch above threshold.
 - d. Doors swinging over carpet = $\frac{3}{4}$ -inch above top of concrete subfloor.
- B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.
- D. Pre-Assembled Doors and Frames:
 1. Coordinate with Section 08 7100 for all hardware requirements, including installation.

2.8 SHOP PRIMING

- A. Doors for Transparent (Stained) Finish:
 1. Shop seal faces and edge of doors, including cutouts, with stain (if required), other required pretreatments, and first coat of finish as specified in Section 09 9300 "Staining and Transparent Finishing".

2.9 FACTORY FINISHING

- A. Transparent (Stain) Finish: Typical
 1. Factory-applied by Manufacturer following [AWI](#) Section 1500 requirements for Custom Grade "TR-6". Finish shall consist of a four-coat process with a minimum 3-mil dry film thickness on all surfaces.
 - a. Apply vinyl wash coat by spray or roller; fully pad into surfaces and wipe off.
 - b. Apply stain by spray or roller; fully pad surfaces and wipe off.
 - c. Sand lightly using 220-grit paper.

WOOD DOORS (RESIDENCE INN)

- d. Apply final finish of two coats of clear, transparent, catalyzed vinyl resin by spray or roller.
- e. Stain Color:
 - 1) Stained to Match; Wilsonart Plastic Laminate, Warehouse Oak #7969K-12.
 - a) Sheen: Satin.
- B. Laminate plastic finish.
 - 1. As specified.
 - 2. As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames prior to hanging door.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation see Section 08 7100 "Door Hardware".
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and of referenced [AWI](#) standard and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of [NFPA](#) 80.
- C. Job-Fit Doors:
 - 1. Field-verify dimensions of each new installed door frame; trim each door as required to properly fit each frame within specified dimensional tolerances; unequal trimming may be required.
 - 2. Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and matching.
 - a. Trim non-rated doors equally from both sides when fitting for width and from top and bottom when fitting for height. Do not trim more than **3/4 -inch** from each edge.
 - 3. Fitting Clearances for Non-Rated Doors: Provide 1/8" at jambs and heads; **1/16 -inch** per leaf at meeting stiles for pairs of doors; and **1/8 -inch** from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide **1/4 -inch** clearance from bottom of door to top of threshold.
 - 4. Fitting Clearances for Fire-Rated Doors: Complying with [NFPA](#) 80.
 - 5. Bevel non-rated doors **1/8 -inch** in **2 -inch** at lock and hinge edges.

- 6. Bevel fire-rated doors **1/8 -inch** in **2 -inch** at lock edge, trim stiles and rails only to extent permitted by labeling agency.
- D. Hang doors and adjust for proper clearances and smooth operation without binding.
 - 1. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
 - 2. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- E. Field-Finished Doors: Refer to the following for finishing requirements:
 - 1. Section 09 9000, "Painting"
 - 2. Seal field cuts in top and bottom rails and for hardware with 2 coats of a VOC compliant paint or varnish.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Operation: Rehang or replace doors which do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Clean door and dry wipe with a soft cloth.
- D. After installation, protect doors from damage as recommended by manufacturer during subsequent construction activities. Damaged doors will be rejected and shall be replaced at no additional cost to Owner.
- E. Clean mirrors using cleaning compounds that will not damage mirrors, door finishes or adjacent materials.
- F. Protect mirrors and doors from damage. Replace damaged units at no cost to the Owner.

- END OF SECTION -

- SECTION 08 3113 -**ACCESS DOORS AND PANELS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Access Doors and Frames for Back of House (BOH) and Front of House (FOH) of the Following Types:
 - 2. Wall Access Doors
 - 3. Moisture Resistant Access Doors
 - 4. Ceiling Access Doors
 - 5. Floor/Ceiling System Access Doors
 - 6. Sprinkler System Access Doors

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 04 2000 "Concrete Unit Masonry".
- D. Section 09 2216 "Non-Structural Metal Framing"
- E. Section 09 2900 "Gypsum Board"
- F. Section 09 2116.23 "Gypsum Board Shaft-Wall Assemblies".
- G. Section 09 5123 "Acoustical Tile Ceilings".
- H. Section 09 9123 "Interior Painting".
- I. Section 09 9123.13 "Paint Schedule".
- J. Section 09 9600 "High-Performance Coatings" for exterior applications.

- K. Division 9 for other ceiling types not specifically listed
- L. Division 21, 22 and 23 Sections for coordination of access to valves and other concealed items.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [ASTM International \(ASTM\)](#) Publications:
 - 1. E119 "Standard Test Methods for Fire Tests of Building Construction and Materials"
- C. [National Association of Architectural Metal Manufacturers \(NAAMM\)](#) Publications:
 - 1. "Metal Finishes Manual"
- D. [National Fire Protection Association \(NFPA\)](#) Publications:
 - 1. NFPA 80 "Standard for Fire Doors, Fire Windows"
 - 2. NFPA 252 "Standard Methods of Fire Tests of Door Assemblies"
- E. [Underwriter's Laboratories, Inc. \(UL\)](#) Standards
 - 1. UL 10B "Standard for Fire Tests of Door Assemblies"
 - 2. UL 263 "Standard for Fire Tests of Building Construction and Materials"

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.
 - 1. Shop Drawings and Samples:
 - a. Submit copies of Shop Drawings of all items specified herein to [Architect] [Owner's Representative] for approval. Obtain approval of Drawings prior to proceeding with manufacturing. Shop Drawings shall indicate: Elevations of each door type; Details of each frame type; Location in the building for each item;

ACCESS DOORS AND PANELS

Conditions at openings with various wall thicknesses and material; Typical and special details of construction; Methods of assembling sections; Locations and installation requirements for hardware; Size, shape, and thickness of materials; Joints and connections.

1.6 QUALITY ASSURANCE

- A. Access doors shall be fabricated in accordance with standards and specifications established by Steel Door Institute.
- B. Fire Rated Access Doors and Frames: Comply with [NFPA](#) 80. Provide products listed by [UL](#) or another testing agency acceptable to local jurisdictions on each fire rated access door. Where required by local codes comply with the following:
 - 1. [ASTM](#) E119
 - 2. [NFPA](#) 252
 - 3. [UL](#) 10B
 - 4. [UL](#) 263
- C. Access panels shall be flush with finished wall or ceilings, except where panels are located in acoustic tile or paneling, the door shall be recessed to receive adjacent finish material.
- D. Access panel finishes shall be coordinated with the finish treatment of the area.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver access doors cartoned or crated to provide protection during transit and job storage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 SHOP PAINTING

- A. Apply a primed finish to all ferrous metal surfaces furnished under this Section. Clean and chemically treat metal surfaces to assure maximum paint adherence. Follow with a dip or spray coat of rust-inhibitive metallic oxide, zinc chromate, or synthetic resin primer on all exposed surfaces. Finished surfaces shall be smooth and free from irregularities and rough spots. Each coat of paint shall be separately baked or oven dried. The time and temperature for drying shall be in accordance with manufacturer's recommendations for developing maximum hardness and resistance to abrasion.

2.3 ACCESS UNITS – BACK OF HOUSE (BOH)

- A. Wall Access Doors (Non-rated):
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. "WB Series"; [J.L. Industries](#) (800-554-6077)
 - b. "Type RDW"; [Karp Associates, Inc.](#) (800-888-4212)
 - c. "Model NW Series"; [Nystrom Building Products](#) (800-547-2635)
 - d. "Style DW"; [Milcor, Inc.](#), a brand of Commercial Products Group of Hart & Cooley, Inc. (800-624-8642)
 3. Door Size: Select from manufacturer's standard sizes to suit required opening.
 4. Designed for flush installation in wall construction. Construct of metal with concealed continuous hinge, having recessed screwdriver latch, size as indicated.
- B. Wall Access Doors (Fire-Rated):
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. "FDWB Series"; [J.L. Industries](#) (800-554-6077)
 - b. "Type KRP-450 FR"; [Karp Associates, Inc.](#) (800-888-4212)
 - c. "IW Model Series"; [Nystrom Building Products](#) (800-547-2635)
 3. Door Size: Select from manufacturer's standard sizes to suit required opening.
 4. Fire Rating: 1 and 1-1/2 hour labeled.
- C. Moisture Resistant Access Doors (Non-rated):
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. Larsen "L-MPSS" stainless steel frame and "L-MPSS" stainless steel door, by [Larsen's Manufacturing Co](#), with continuous, offset and concealed hinge, security fastener. (800-527-7367)
- D. Ceiling Access Doors (Non-rated):
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. "Model RDW"; [Karp Associates, Inc.](#) (800-888-4212)
 - b. "Style DW"; [Milcor, Inc.](#), a brand of Commercial Products Group of Hart & Cooley, Inc. (800-624-8642)
 - c. Model WB-DW; [Williams Brothers Corporation of America](#) (800-255-5515)
 - d. "WB Series"; [J.L. Industries](#) (800-554-6077)
 - e. "NW Series"; [Nystrom Building Products](#) (800-447-2635)
 3. Performance Criteria
 - a. Door Size: Select from manufacturer's standard sizes to suit required opening.

- b. Sheet metal construction with concealed continuous hinge, flush design. Provide each door with self-closing mechanism and standard flush design "self-latching" latch.

E. Ceiling Access Doors (Fire-Rated):

1. Avendra, LLC Preferred Manufacturers:
 - a. None
2. Approved Manufacturers:
 - a. "Model KRP-350FR"; [Karp Associates, Inc.](#) (800-888-4212)
 - b. "Model WB-FRC"; [Williams Brothers Corporation of America](#) (800-255-3515)
 - c. "FDWB Series"; [J.L. Industries](#) (800-554-6077)
 - d. "IW Series"; [Nystrom Building Products](#) (800-447-2635)
3. Performance Criteria:
 - a. Door Size: Select from manufacturer's standard sizes to suit required opening.
 - b. Fire Rating: 1 and 1-1/2 hour labeled.
 - c. Sheet metal construction with concealed continuous hinge, flush design. Provide each door with self-closing mechanism and standard flush design "self-latching" latch.

F. Floor/Ceiling System Access Doors (Fire Rated)

1. Avendra, LLC Preferred Manufacturers:
 - a. None
2. Approved Manufacturers:
 - a. "Model 3210"; [Milcor, Inc.](#), a brand of Commercial Products Group of Hart & Cooley, Inc. (800-624-8642)
 - b. Approved substitution by [Williams Brothers Corporation of America](#)
 - c. Approved substitution by [J.L. Industries](#) (800-554-6077)
 - d. Approved substitution by [Nystrom Building Products](#) (800-447-2635)
 - e. Approved Substitution by [Karp Associates, Inc.](#) (800-888-4212)
3. Performance Criteria:
 - a. Size: Select from manufacturer's standard sizes to suit required opening.
 - b. Fire Rating: 1 and 1-1/2 hour labeled.
 - c. Sheet metal construction with concealed continuous hinge, flush design. Provide each door with self-closing mechanism and standard flush design "self-latching" latch.
 - d. Finish: Bonderized galvanized steel.

G. Sprinkler System Access Doors (Fire-rated)

1. Performance Criteria:
 - a. UL B (1-1/2 hr.) rated with automatic closer, UL rated anchors for construction in which door will be installed, and lockset with knob released keyed as directed by Owner.
2. Avendra, LLC Preferred Manufacturers:
 - a. None
3. Approved Manufacturers:

- a. [Milcor, Inc.](#), a brand of Commercial Products Group of Hart & Cooley, Inc. (800-624-8642)
- b. [Karp Associates, Inc.](#) (718-784-2105)
- c. [Williams Brothers Corporation of America](#) (309-796-2371)

2.4 ACCESS UNITS – FRONT OF HOUSE (FOH)

A. Wall Access Doors (Non-rated):

- 1. Flush wall application:
 - a. Approved Manufacturers:
 - 1) Typical:
 - a) Basis of Design shall be; Bauco Plus® by APS, Access Panel Solutions, www.accesspanelsolutions.com
 - b) Alternate: RGB Series by Nystrom, www.nystrom.com
 - b. Door Size: Select from manufacturer's standard sizes to suit required opening.
 - c. Latching:
 - 1) Typical: Touch latch
 - 2) As directed by Architect: Cam Latch
 - d. Frameless door designed for flush installation in wall construction with inlay gypsum board.
 - 1) Construct concealed access panel with aluminum frame, perimeter factory installed gasket and glass-fibre-reinforced nylon hardware with concealed hinges.
- 2. Flush wall application with tile finish:
 - a. Approved Manufacturers:
 - 1) Typical:
 - a) Basis of Design shall be; Bauco Plus II® by APS, Access Panel Solutions, www.accesspanelsolutions.com
 - b) Alternate: RGT Series by Nystrom, www.nystrom.com
 - b. Door Size: Select from manufacturer's standard sizes to suit required opening.
 - c. Latching:
 - 1) Typical: Touch latch
 - 2) As directed by Architect: Cam Latch
 - d. Frameless removable door designed for flush installation in wall construction with inlay gypsum board.
 - 1) Construct concealed removable access panel with aluminum frame, perimeter factory installed gasket and glass-fibre-reinforced nylon hardware with concealed hinges and safety cable.

B. Moisture Resistant Access Doors (Non-rated):

- 1. Refer to Back of House (BOH Article heading

C. Ceiling Access Doors (Non-rated):

1. Flush wall application:

a. Approved Manufacturers:

1) Typical:

a) Basis of Design shall be; Bauco Plus® by APS, Access Panel Solutions, www.accesspanelsolutions.comb) Alternate: RGB Series by Nystrom, www.nystrom.com

b. Door Size: Select from manufacturer's standard sizes to suit required opening.

c. Latching:

1) Typical: Touch latch

2) As directed by Architect: Cam Latch

d. Frameless door designed for flush installation in wall construction with inlay gypsum board.

1) Construct concealed access panel with aluminum frame, perimeter factory installed gasket and glass-fibre-reinforced nylon hardware with concealed hinges.

D. Wall Access Doors (Fire-Rated):

1. Refer to Back of House (BOH Article heading

E. Ceiling Access Doors (Fire-Rated):

1. Refer to Back of House (BOH Article heading

F. Floor/Ceiling System Access Doors (Fire Rated)

1. Refer to Back of House (BOH Article heading

G. Sprinkler System Access Doors (Fire-rated)

1. Refer to Back of House (BOH Article heading

2.5 FABRICATION

A. Grind exposed welds smooth and flush with adjacent surfaces.

B. Provide all required attachment devices and fasteners to secure units to substrates.

2.6 FINISHES

A. Base Metal Protection: Factory prime coat units with electrostatic baked on electrostatic powder. Prime exposed edges with coat of white rust-inhibitive paint.

1. For steel finishes comply with [NAAMM's](#) "Metal Finishes Manual for Architectural and Metal Products".

B. For fire-rated access doors, furnish units with ceramic fiberboard panel insert, attach to outside face of door, ready for field painting.

PART 3 - EXECUTION

3.1 GENERAL

- A. Verify rough openings for door and frame are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Install units and their accessories in accordance with final Shop Drawings, manufacturer's data, and as herein specified.
- B. Install frame plumb and level in wall and ceiling openings. Position to provide convenient access to concealed work requiring access. Secure rigidly in place.

3.3 ADJUSTMENT

- A. Check and readjust operating finish hardware items in work just prior to final inspection.
- B. Remove and replace defective work including doors or frames which are warped, bowed, or otherwise damaged.

3.4 TOUCH-UP

- A. Immediately after erection of work, sand smooth any rusted or damaged areas of prime coat and touch-up of compatible air drying primer.

3.5 PROTECTION:

- A. Protect doors and frames from damage during transportation and at the job site; store at the site under cover on wood blocking or on suitable floors. After installation, protect doors and frames from damage during subsequent construction activities. Damaged work will be rejected and shall be replaced with new work. Factory enameled finished work shall be shipped in cartons or other suitable containers.

3.6 CLEANING:

- A. Upon completion, metal surfaces of doors and frames that are completely factory finished shall be thoroughly cleaned and touched-up as recommended by the door manufacturer.

- END OF SECTION -

- SECTION 08 3119 -**HORIZONTAL ACCESS DOORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior Horizontal Access doors and frames:
 - a. Non Rated:
 - 1) Drainable

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 8113 "Sustainable Design Requirements".
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 03 3000 "Cast-In-Place Concrete" for concrete paving.
- E. Section 08 3113 "Access Doors and Frames" for access doors and frames within the building, walls and ceilings.
- F. Section 07 7200 "Roof Accessories" for roof hatches
- G. Section 08 7100 "Door Hardware" for coordination of cylinder lock and keyway
- H. Section 09 9600 "High-Performance Coatings" for painted finishes.
- I. Section 32 1316 "Decorative Cement Concrete Paving"
- J. Section 32 1373 "Concrete Paving Joint Sealants" for exterior horizontal joint sealant
- K. Civil Drawings for exterior paving.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Uniform Plumbing Code (UPC) 2006 with City of Phoenix administrative provisions and amendments.
- C. International Mechanical Code with City of Phoenix administrative provisions and amendments.
- D. National Electrical Code / NFPA 70 2008, with City of Phoenix administrative provisions and amendments.
- E. American Society for Testing and Materials (ASTM)
 - 1. ASTM A 36-93a: Standard Specification for Structural Steel
- F. International Organization for Standardization (ISO)
 - 1. ISO 9001:2008 Certified
- G. Manufacturer's recommendations and specifications.

1.5 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300 "Submittal Procedures".
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. Shop Drawings:
 - 1. Submit manufacturer's shop drawings, installation drawings, installation instructions and maintenance instructions.
 - 2. Include profiles, accessories, locations, dimensions, plans, details, and attachments to other work.
 - 3. Detail fabrication and installation of access doors and frames for each type of substrate.
- E. Product Schedule: Provide complete horizontal access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.6 INFORMATIONAL SUBMITTALS

- A. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- B. Structural calculations stamped by a registered professional in state door is installed which corroborates the H20 loading capacity.
- C. Closeout Submittals:

HORIZONTAL ACCESS DOORS

1. Submit under provisions of Section 01 7700 "Closeout Procedures".
2. Warranty: Submit specified warranty.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Traffic Rated Horizontal Access Doors and Frames meeting listed Traffic rating for horizontal access doors subject to vehicular loads.
- C. Live load Rated Horizontal Access Doors and Frames meeting listed Live Load rating as herein specified.
- D. Access panels and frames shall be flush with finished adjacent paving, except where access doors are installed with recessed doors to accept paving material to flush out with adjacent material.
- E. Access panel finishes shall be coordinated with the finish treatment of the area.
- F. Manufacturer Qualifications
 1. Minimum (10) ten years experience in the manufacture of horizontal access doors.
 2. Minimum (10) ten years experience in the fabrication of doors.
- G. Installer Qualifications
 1. Minimum three years experience in the installation of doors.

1.8 COORDINATION

- A. Verification: Determine specific locations and sizes for horizontal access doors needed to gain access to concealed plumbing, mechanical, electrical or other concealed work, and indicate in the schedule specified in "Submittals" Article.

1.9 JOB CONDITIONS

- A. Verify that other trades with related work are complete before installing vault access door(s).
- B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
- D. Observe all appropriate OSHA safety guidelines for this work.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000 "Product Requirements".

- B. Deliver horizontal access doors and frames for installation to the site in manufacturer's original packaging or crates.
 - 1. Handle products in accordance with manufacturer's instructions.
 - 2. Store in dry, secure location, protected against traffic and weather.

1.11 WARRANTY

- A. Comply with provisions of Section 01 7700.
- B. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (5) five years from the date of purchase.
 - 1. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.
 - 2. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.
- C. Manufacturer's Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Load capacity: As herein specified for model indicated.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide model number; **VSH-H20-A-(Width)-(Length)-S-GS** by **Versa Hatch**, www.versahatch.com as herein specified or comparable product by one of the following:
 - 1. The Bilco Company, www.bilco.com
 - 2. Babcock-Davis.
 - 3. Nystrom, Inc.

2.3 MATERIALS – DRAINABLE ALUMINUM FLOOR ACCESS DOORS AND FRAMES – SINGLE LEAF

- A. General:
 - 1. Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle that allows for one-handed closure, and recessed lift handle.
 - 2. The vault access door shall be pre-assembled from the manufacturer.

HORIZONTAL ACCESS DOORS

3. Furnish and install where indicated on plans vault access door:

B. Schedule:

1. Model: As listed (Channel Frame Reinforcing)
2. Type: Single leaf
3. Drainable: Yes
4. Lid: Waterproof
5. Fire rated: No
6. Size:
 - a. As indicated on Drawings

C. Performance characteristics:

1. Wheel Loading:
 - a. Cover shall be reinforced to support AASHTO H-20 wheel load with a maximum deflection of 1/150th of the span.
 - 1) Manufacturer to provide structural calculations stamped by a registered professional engineer
2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
3. Operation of the cover shall not be affected by temperature.

D. Components:

1. Cover: Shall be 1/4 -inch (6.3 mm) thick aluminum diamond pattern and reinforced.
 - a. Non-Slip coating option.
2. Frame: Channel frame shall be 1/4 -inch (6.3 mm) extruded aluminum with bend down anchor tabs around the perimeter.
3. Drain Coupling: Provide a 1-1/2 -inch (38mm) drain coupling located in the right front corner of the channel frame.
4. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing.
 - a. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly.
 - b. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4 -inch gusset support plate.
5. Exterior Handle:
 - a. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.
6. Underside Handle:
 - a. A Type 316 stainless steel snap lock with fixed handle mounted on the underside of the cover.
7. Locking:
 - a. Keyed cylinder dead bolt lock option and T Handle
 - 1) Hatch shall be openable from the basement side when locked from exterior side.

- E. Hardware: (Stainless steel through out)
1. Hinges:
 - a. Heavy forged brass hinges, each having a minimum (9.5mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.
 - b. Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.
 2. Cover:
 - a. Shall be equipped with a hold open arm that automatically locks the cover in the open position.
 - b. Shall be fitted with the required number and size of compression spring operators.
 - 1) Springs and spring tubs shall be Type 316 stainless steel.
 - 2) Compression spring tubes shall be an anti-corrosive composite, all fasteners shall be Type 316 stainless steel material, and all other hardware shall be zinc plated and chromate sealed
- F. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
- G. Safety protection:
1. Fall protection grating:
 - a. Material: Aluminum
 - b. Color: Powder coated Yellow
 - c. Warranty: (25) twenty five years
 - d. Standard: Meet OSHA 29 CFR 1910.23
 - e. Hardware: Stainless steel
 - f. Hold open device: Yes
 - g. Padlock hasp: Yes

2.4 STAINLESS STEEL MATERIALS

- A. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304 or Type 316. Remove tool and die marks and stretch lines or blend into finish.

2.5 ALUMINUM MATERIALS

- A. Aluminum Extrusions: **ASTM B 221** (**ASTM B 221M**), Alloy 6063-T6.
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- C. Aluminum Sheet: **ASTM B 209** (**ASTM B 209M**), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness according to **ANSI H35.2** (**ANSI H35.2M**).

HORIZONTAL ACCESS DOORS

2.6 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- E. Frame Anchors: Same type as door face.
- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.7 FABRICATION

- A. General: Provide horizontal access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes.
- C. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder locks, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of **1 mil (0.025 mm)** for topcoat.
- E. Stainless-Steel Finishes:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4 unless indicated otherwise.
 3. Bright, Cold-Rolled, Unpolished Finish: No. 2B unless indicated otherwise.
- F. Aluminum Finishes:
1. Mill finish where specified
 2. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or AA-M12C22A31, Class II, 0.010 mm] or thicker where specified.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions, referenced standards and approved drawings.
- B. Ensure that doors are installed plumb and true, free of warp or twist, within tolerances specified in referenced standards and approved drawings.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 CVOORDINATION

- A. Coordinate with Door Hardware for cylinder type and keying.
 1. Refer to Section 08 7100 "Door Hardware"

HORIZONTAL ACCESS DOORS

3.4 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.5 PROTECTION AND CLEANING

- A. Clean doors in accordance with manufacturer's instructions.

- END OF SECTION -

- SECTION 08 3214 -**EXTERIOR GLAZED PANEL FOLDING DOORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes;
 - 1. Engineered monumental thermally broken multi-panel folding aluminum-framed glass doors with fingertip operation which slide in head and sill tracks for exterior locations complete with hardware and other related components as shown on the drawings and as specified within this specification section.
 - a. System designed to provide an operable glass wall and door system, with sizes and configurations as shown on drawings and specified herein.
 - 2. System shall be:
 - a. Thermally broken assembly with sill(s) as specified and swing direction as specified
 - 3. Sill shall be type as specified.
 - a. Architect shall select from all options during shop drawing review.
 - 4. Glass and glazing, factory glazed
 - 5. Operating hardware, door manufacturer's standard.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 RELATED REQUIREMENTS

- A. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- B. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- C. Section 01 8336 "Exterior Enclosure Performance Requirements"
- D. Section 03 4510 "Precast Architectural Concrete Specialties"

- E. Section 04 2115 "Adhered (Thin) Brick Veneer"
- F. Section 04 4200 "Exterior Stone Cladding (adhered)"
- G. Section 04 7300 "Manufactured Stone Masonry"
- H. Section 05 1200 "Structural Steel Framing"
- I. Section 05 4000 "Cold Formed Metal Framing"
- J. Section 06 1053 "Miscellaneous Rough Carpentry"
- K. Section 07 2419 "Exterior Insulation and Finish System (EIFS)"
- L. Section 07 9200 "Joint Sealants"
- M. Section 07 9213 "Exterior Façade Joint Sealants"
- N. Section 08 8013 "Exterior Glazing" for glazing type if not herein specified.
- O. Section 08 4113 "Aluminum-Framed Entrances and Storefronts" for coordinating finishes of aluminum fenestration units on the building exterior.
- P. Section 08 4413 "Glazed Aluminum Curtain Walls" for coordinating finishes of aluminum fenestration units on the building exterior.
- Q. Section 08 7100 "Door Hardware" for hardware not specified in this Section.
- R. Section 09 2900 "Gypsum Board"
- S. Section 09 3053 "Exterior Tiling"
- T. Pertinent sections specifying adjacent exterior wall cladding and finishes.
- U. Manufacturer's recommendations and specifications.

1.5 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 520, Voluntary Specification for Rating the Severe Wind-Driven Rain Resistance of Windows, Doors and Skylights
 - 2. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
 - 3. AAMA 1304, Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
 - 4. AAMA 2603.02, Voluntary Specifications, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

5. AAMA 2604, Voluntary Specifications, Performance Requirements and Test Procedures for Pigmented for High Performance Organic Coatings on Aluminum Extrusions and Panels.
6. AAMA 2605, Voluntary Specifications, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. American National Standards Institute (ANSI)
 1. ANSI Z97.1, Safety Performance Specifications and Methods of Test for Safety Glazing Material Used In Buildings.
- D. American Society for Testing and Materials (ASTM)
 1. ASTM E 283, Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 2. ASTM E 330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 3. ASTM E 331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 4. ASTM E 547, Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.4. ASTM E 331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 5. ASTM E 2268, Standard Test Method for Water Penetration of Exterior Windows, Skylights, and Doors by Rapid Pulsed Air Pressure Difference.
 6. ASTM F 842, Standard Test Method for Measuring the Forced Entry Resistance of Sliding Door Assemblies
- E. Consumer Product Safety Commission (CPSC)
 1. CPSC 16CFR-1201, Safety Standard for Architectural Glazing Materials.
- F. National Fenestration Rating Council (NFRC)
 1. NFRC 100, Procedure for Determining Fenestration Product Thermal Materials
 2. NFRC 200, Procedure for Determining Solar Heat Gain Coefficient
 3. NFRC 400, Procedure for Determining Fenestration Product Air Leakage
- G. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- H. Manufacturer's recommendations and specifications.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
- B. Shop Drawings: For folding/sliding aluminum-framed glass doors. Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, and the following:
 1. Include plans, elevations, sections, and installation details.
 2. Include clearances required for operation, operating and control mechanisms, access requirements and accessory items.

3. Mullion details for fenestration combinations including reinforcement and stiffeners.
 4. Joinery details.
 5. Expansion provisions.
 6. Flashing and drainage details.
 7. Weather-stripping details.
 8. Thermal-break details.
 9. Glazing details.
 10. Accessories.
 11. Detailed Order Documentation:
 - a. Indicate outside net frame dimensioning
 - b. Direction of swing (outswing or inswing)
 - c. Number of panels and folding configuration of panels left or right, main entry swing panel if applicable based on configuration selected.
 - d. Typical head jamb, side jambs and sill details and type of glazing material
 - e. Other options available from manufacturer.
 12. Indicate all frames that are to receive security devices in accordance with the reviewed security system shop drawings and submittals, and identify the types of devices that are to be installed on each frame.
- C. Samples for Initial Selection: For each type of folding/sliding aluminum-framed glass door indicated.
1. Include similar Samples of hardware and accessories requiring color selection.
- D. Samples for Verification: For folding/sliding aluminum-framed glass doors and components required, prepared on Samples of size indicated below:
1. Main Framing Member: **12-inch (300-mm-)** long section with weather stripping, glazing bead and factory-applied color finish.
 2. Hardware: Full-size units with factory-applied finish.

1.7 INFORMATION SUBMITTALS

- A. Qualification Data: For qualified Installer, manufacturer and professional engineer.
- B. Delegated-Design Submittal: For folding/sliding aluminum-framed glass doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation and used to determine the following:
1. Structural test pressures and design pressures from wind loads indicated.
 2. Deflection limitations of glass framing systems.
- C. Qualification Data: For each of the following, demonstrate compliance with specified attributes.
1. Manufacturer
 2. Installer
 3. Professional Engineer.
- D. VOC Submittals:

- 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each class, grade, and size of folding/sliding aluminum-framed glass door.
- F. Field quality-control reports.
- G. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.
- H. Warranty: Sample of special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 7700.
- B. Submit Installation Instructions from manufacturer.
 - 1. Identify with project name, location and completion date, type and size of unit installed.
- C. Warranty: Submit specified warranty.

1.9 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
- B. Preinstallation Conference: Conduct conference at Project site. Convene two weeks before starting work of this section, but not before completion of all required submittals.
 - 1. Attendance required:
 - a. Installer, installer of each component of associated work.
 - b. Installers of substrate construction to receive work of this section.
 - c. Installers of work penetrating walls and other work in the surrounding area that must precede or follow work of this section.
 - d. Architect.
 - e. Owner.
 - f. Product manufacturer's representative.
 - g. Other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, test agencies, and governing authorities.
 - 2. Objectives include:
 - a. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - b. Review methods and procedures related to work of this section.
 - c. Review structural loading limitations of adjacent construction.
 - d. Review product and assembly requirements (drawings, specifications, and other contract documents).

- e. Review required submittals.
- f. Review and finalize construction schedule related to work of this section and verify availability of materials, Installer's personnel, equipment, and facilities needed to make required progress and avoid delays.
- g. Review required inspection, testing, certifying, and material usage accounting procedures.
- h. Review expected weather and forecasted weather conditions and procedures for responding to inclement conditions, including provision of temporary waterproofing for occupied spaces where applicable.
- i. Record discussion of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
- j. Review notification procedures for weather or non-working days.

1.10 QUALITY ASSURANCE

- A. Provide products that comply with test-performance requirements indicated, as evidenced by reports based on tests performed on manufacturer's standard assemblies by a qualified testing agency.
- B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations that are similar to those indicated for this Project in material, design, and extent.
- D. Manufacturer Qualifications:
 - 1. A manufacturer capable of fabricating folding/sliding aluminum-framed glass doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
 - 2. Provide complete, precision built, engineered, pre-fitted unit by a single source manufacturer with at least Fifteen (15) years experience in providing folding door systems for large openings and at least Seven (7) years experience manufacturing in the North American market.
 - a. The manufacturer shall have a quality management system registration to the ISO 9001: 2008 Standard
- E. Installer Qualifications:
 - 1. An installer acceptable to folding/sliding door manufacturer for installation of units required for this Project.
 - 2. Installer experienced in the installation of manufacturer's products or other similar products for large openings preferred. Installer to follow Installation Instructions supplied by Manufacturer.
 - 3. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility including preparation of data for folding/sliding aluminum-framed glass doors, including Shop Drawings and Designated-Design

EXTERIOR GLAZED PANEL FOLDING DOORS

- a. Submittal, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- F. Provide test reports from AAMA accredited laboratories certifying the performances as specified.
- G. Source Limitations: Obtain folding/sliding aluminum-framed glass doors from single source from single manufacturer.
- H. Fenestration Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440, "Standard/Specification for Windows, Doors, and Unit Skylights," for minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
 - 1. Provide AAMA-certified, folding/sliding aluminum-framed glass doors with an attached label.
- I. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction.
- J. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.
- K. Product Options: Drawings indicate size, profiles, and dimensional requirements of folding/sliding aluminum-framed glass doors and are based on the specific manufacturer system indicated and herein specified as 'Basis of Design'. Refer to Division 1 Section "Product Requirements." Do not modify size and dimensional requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval.
 - a. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.11 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of folding/sliding aluminum-framed glass door openings by field measurements before fabrication.

1.12 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install folding doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants after completion of construction during the remainder of the construction period.
 - 1. Deliver materials to job site in manufacturer's packaging.
 - 2. When forklift is not available remove panels from packaging and carefully transfer panels to jobsite area.
 - 3. Protect stored product from damage.
 - 4. Store product flat in dry, well ventilated area out of direct sunlight, under cover, protected from weather, moisture and excessive dryness and construction activities.

EXTERIOR GLAZED PANEL FOLDING DOORS

1.13 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sliding aluminum-framed glass doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection.
 - c. Water leakage or air infiltration.
 - d. Faulty operation of movable sash and hardware.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - f. Deterioration of insulating glass and laminated glass as defined in Division 8 Section "Glazing."
 2. Warranty Periods:
 - a. Panel and frame aluminum components, product finishes, folding system hardware, and weather stripping. Ten (10) years
 - b. Rollers and seal failure for insulated glazing: Ten (10) years
 - c. Operating / Locking hardware: Five (5) years
 - d. Anodized finish: One (1) year
 - e. Insulated glass against failure of the air seal and that each unit will be free from material obstruction of vision as a result of fogging or film formation on the internal surfaces.
 - 1) From date of shipment by manufacturer.
 - 2) Normal and regular maintenance is required to maintain the appearance and extend the finish life and maintain proper operation.
 - 3) Ten (10) years

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design aluminum-framed systems including comprehensive engineering analysis by Contractor's qualified professional engineer, using performance requirements and design criteria indicated.
- B. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 2. Dimensional tolerances of building frame and other adjacent construction.
 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.

EXTERIOR GLAZED PANEL FOLDING DOORS

- c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Glazing-to-glazing contact.
 - e. Noise or vibration created by wind and by thermal and structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
 - h. Failure of operating units.
 - 4. Provide from manufacturer that has independently tested typical units.
- C. Performance Requirements:
- 1. Provide from manufacturer that has independently tested typical units.
 - 2. Testing results to include air infiltration in accordance with ASTM E 283, water penetration in accordance with ASTM E 331 and E 547, structural loading in accordance with ASTM E 330, and forced entry in accordance with AAMA 1304.
 - 3. Large and Small Missile Impact in Accordance with ASTM E 1886 and ASTM E 1996.
- D. Weather Resistance:
- 1. Design shall provide waterproofing and an air-vapor retarder that is continuous at all penetrations, transitions, and other conditions. System shall integrate with the building's waterproofing and air-vapor-retarder system to provide a weathertight transition. System shall not allow the movement of the interior or exterior air to flow vertically within the assembly. Methods employed to prevent internal air movement shall not restrict water flow channels or prevent thermal movement of the frames.
 - 2. Water penetration into the system is acceptable only if all of the following conditions are satisfied; any other water penetration is considered water leakage and is unacceptable:
 - a. Water is immediately contained and drained to the exterior.
 - b. There is no wetting of a surface that could be damaged by moisture or that would be visible to building occupants.
 - c. There would be no staining or other damage to completed building or its furnishings.
 - d. The definition of water leakage governs over the other definitions that may appear in referenced documents.
 - 3. Provide internal gutters and weep systems to collect and drain water leakage and condensation to the exterior at the sill of each opening. Glazing assemblies shall have on isolated gutter cavity at each glass perimeter so the leakage is confined to and wept from the opening of origin. Glazing assemblies shall have continuous spliced gutters at mullions splices, with sealed and caps at termination conditions. Systems shall not direct water to contact edges of insulating glass units. Prevent water infiltration at weeps. Coordinate gutter and weep systems with other sections to ensure complete drainage of water outside the building envelope.
- E. Test Specimen Requirements:
- 1. Air, Water and Structural test specimen sizes and configurations are to be in accordance with the minimum requirements of AAMA/NWWDA 101/I.S.2 - 97, for the type of aluminum Folding / Sliding Aluminum Framed Glass Door and performance rating required.
 - 2. Thermal test specimen sizes and configurations are to be in accordance with the National Fenestration Rating Council, Inc., NFRC 100 procedure.

F. Overall Rating: DP 70

G. Test Procedure and Performance:

1. Air Infiltration: Complete testing in accordance with ASTM E 283 & NFRC 400, cfm/ft²
 - a. Recessed / Flush Sill: (Field installed weep holes)
 - 1) Inswing: 0.10 at 1.57 psf (.55 L/s/m²) and 0.31 at 6.24 psf with weeps, 0.26 without weeps
 - a) NANA WALL: SL70
 - b) LaCantina: Folding Aluminum System
2. Static Water Penetration under Pressure:
 - a. Complete testing in accordance with ASTM E 331 & ASTM E 547.
 - 1) There shall be no uncontrolled water leakage.
 - b. Recessed / Flush Sill: (Field installed weep holes)
 - 1) Inswing:
 - a) NANA WALL: SL70
 - b) LaCantina: Folding Aluminum System
3. Dynamic Water Penetration under Pressure:
 - a. Complete testing in accordance with AAMA 520 & ASTM E 2268
 - 1) Sill shall show no more evidence than allowable water entry per testing standards
 - b. Recessed / Flush Sill: (Field installed weep holes)
 - 1) Inswing: Sill shall show no more evidence than allowable water entry at a dynamic rated air pressure difference of per mfg. psf. (Performance Level per mfg.).
 - a) NANA WALL: SL70
 - b) LaCantina: Folding Aluminum System
4. Structural Test Performance:
 - a. Uniform Load Structural:
 - 1) Reinforced Panels or thicker extrusions: Provide system with optional reinforced posts or thicker extrusions that when tested according to ASTM E 330 at 150 percent of positive and negative design pressures with panel sizes of 3 –feet wide and 8 –feet high achieved;
 - a) Raised Sill: Inswing unit DP rating of +70 psf / -100 psf
 - b) Saddle / ADA Sill: Inswing units DP ratings of +/- 70 psf.
 - 2) Standard system: Provide standard system when tested according to ASTM E 330 at 150 percent of positive and negative design pressures with panel sizes of 2 –feet 11 –inches wide and 8 –feet 1 –inches high achieved;
 - a) Raised Sill: Inswing unit DP rating of +55 psf / -90 psf
 - b) Saddle / ADA Sill: Inswing units DP ratings of +/- 50 psf.
5. Forced Entry Resistance:
 - a. Provide system that when tested according to ASTM F842 and AAMA 1304 there was no entry.
6. Solar Heat Gain Coefficient:

- a. Unit to be rated, certified and labeled in accordance with NFRC 200, shown in manufacturers latest published data for the glazing, sill, and direction of opening specified.
- 7. Thermal Transmittance (U-Factor) Value:
 - a. Thermal testing is to be rated, certified and labeled in accordance with the National Fenestration Rating Council, Inc., NFRC 100 procedure.
 - b. Glass for Thermal Transmittance testing shall be in accordance with the requirements for validation of the NFRC glass option matrix.
 - c. Unit to be rated, certified and labeled in accordance with NFRC 200, shown in manufacturers latest published data for the glazing, sill, and direction of opening specified.
 - d. U-Factor:
 - 1) Maximum Nonresidential U-Factor is to be 0.55
- 8. Operating Force:
 - a. The operating sash panel Breakaway Force (the force required to disengage the lock panel from the lock jamb) shall not exceed 25 Lbs.
 - b. The operating sash panel Motion Force (the force required to maintain the sash in motion) shall not exceed 13 Lbf
- 9. Deglazing:
 - a. Conduct testing in accordance with ASTM E 987.
 - 1) The Stiles shall not deglaze to a maximum pressure of 70 PSF.
 - 2) The Rails shall not deglaze to a maximum pressure of 50 PSF.
- H. Structural Design Performance: Provide Folding / sliding aluminum-framed glass doors capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA/CSA 101/I.S.2/A440, Uniform Load Structural Test:
 - 1. Wind Loads:
 - a. As indicated on Drawings and as specified in Section 01 8316 "Exterior Enclosure Performance Requirements".
 - 1) Refer also to Drawings.
 - 2. Other Design Loads: As indicated on Drawings and as specified in Section 01 8316 "Exterior Enclosure Performance Requirements".
 - 3. Deflection Limits: Design glass framing system to limit lateral deflections of glass edges to less than L/720 of glass-edge length or 1/4 -inch (6.35 mm), whichever is less, at design pressure based on testing performed according to AAMA/WDMA/CSA 101/I.S.2/A440, Uniform Load Deflection Test, or structural computations.
- I. Windborne-Debris Resistance: Provide folding/sliding aluminum-framed glass doors capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing sliding aluminum-frames glass doors identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506 and requirements of authorities having jurisdiction.
- J. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MATERIALS, GENERAL

- A. Aluminum Extrusions: Provide alloy and temper recommended by sliding aluminum-framed glass door manufacturer for strength, corrosion resistance, and application of required finish. Comply with AAMA/WDMA/CSA 101/I.S.2/A440.
 1. Nominal thickness of .078 –inches (2.0mm).
 2. Strength rated as 6063-T5 or F-22 (European standard).
- B. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive for SC 3 severe service conditions and compatible with members, trim, hardware, anchors, and other components of sliding aluminum-framed glass doors. Comply with AAMA/WDMA/CSA 101/I.S.2/A440.
 1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for sliding aluminum-framed glass doors, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- D. Reinforcing Members: Provide aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel reinforcing members that are noncorrosive for SC 3 severe service conditions and that comply with AAMA/WDMA/CSA 101/I.S.2/A440; provide sufficient strength to withstand design pressure indicated.
- E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when sliding aluminum-framed glass door is closed.
 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- F. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701.
 1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 702.
- G. Sealant: For sealants required within fabricated sliding doors, provide sliding aluminum-framed glass door manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 MANUFACTURER

- A. Description: Top-supported, horizontal-folding/sliding, manually operated panel folding doors, with panels joined by hinges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 2. Basis-of-Design Product: Subject to compliance with requirements, provide Monumental Thermally Broken Aluminum Framed Folding Panel System, **Model SL70**, as manufactured by **Nana Wall Systems**, Inc. 707 Redwood Highway, Mill Valley, CA, , www.nanawall.com or a comparable product by one of the following:
 - a. LaCantina Doors, www.lacatinadoors.com, info@lacatinadoors.com – Aluminum Thermally Broken Folding Doors with Impact rating
 - 1) Model: Folding Aluminum System
- B. Folding door opening Size:
1. System capable of spanning **52 –feet** wide x **10 –feet 4 –inch** tall
 2. Size: Refer to drawings
- C. Frame and Panels: From manufacturer's standard profiles, provide head track, side jambs, and panels with dimensions shown on drawings.
1. Provide panels with: standard one lite and glass type as herein specified.
 2. Panels in equal sizes for each multi-panel door opening assembly.
 3. Thickness: **1 3/4 –inch**
 4. Bottom Rail: **10 inch.**
 5. Frame width: **4 inch.**
 6. Color: As selected by Architect from full range of available colors.
- D. Sill: From manufacturer's standard profiles, provide type as specified and coordinate with Drawings. Architect shall select from the following:
1. Recessed / Flush Sill: (Field installed weep holes)
 2. ADA / Low Profile Saddle Sill: (Field installed weep holes)
 3. Raised Sill
- E. Frame and Panels: From manufacturer's standard profiles, provide head track, side jambs, and panels with dimensions shown on drawings.
1. Provide panels with: standard one lite and glass type as indicated.
 2. Panels in equal sizes for each multi-panel door opening assembly.
 3. Thickness: **1 3/4 –inch**
 4. Bottom Rail: **10 inch.**
 5. Frame width: **4 inch.**
 6. Color: As selected by Architect from full range of available colors.
- F. Locking Hardware and Handles:
1. Manufacturer's standard heavy-duty, manually operated metal pulls, levers and latches.
 2. On all secondary panels and pairs of folding panels, provide manufacturer's standard removable custodial handles and concealed two point locking hardware operated by 90

- degree turn of handle between each pair. Face applied flush bolt locking will not be allowed.
- a. Handle finish: As selected by Architect from full range of available finishes.
 3. Main Entry Panel: (Door manufacturers standard) For configurations with a swing panel, provide manufacturer's standard lever handles on the inside and outside, a Schlage compatible lock set with lockable latch, multi-point locking with dead bolt and locking rods at the top and bottom.
 - a. Rods to be concealed and not edge mounted.
 - b. Depression of handles withdraws latch.
 - c. Lifting of handles engages rods and turn of key or thumb turn engages deadbolt and operates lock.
 - d. Provide handle height centered at manufacturer's standard height OR as specified from bottom of panel.
 - 1) Height shall not be less than 30 -inches nor more than 44 -inches maximum in accordance with ADA accessibility requirements and building code
 - a) NANA WALL: 41 3/8 -inches
 - b) LaCantina: 36 -inches
 4. Locking Rods: Aluminum concealed locking rods with standard or reinforced to meet higher structural loading as herein specified and comprised of fiber glass reinforced polyamide end caps at top and bottom.
 - a. Rods to have a stroke of 15/16 -inches (24 mm).
 - b. Rods to be capped with stainless steel tips.
 - c. Rods shall lock into frames top and bottom locking channels.
 - G. Sliding/Folding Hardware: Provide manufacturer's standard combination sliding and folding hardware which is integrated with manufacturer's engineered head track, side jambs and threshold frame system.
 1. General:
 - a. Hardware system to operate with an upper wheel carrier that rolls on the aluminum head track.
 - b. Hardware system carrying capacity to be 220 lbs. per panel.
 - c. A lower track incorporated into the threshold to guide the door panels.
 - d. Upper carrier and lower guide are attached to door panel hinges.
 - e. Jamb panels are attached with top and bottom pivots.
 - f. Panels are connected with hinges including top and bottom hinges attached to top carrier and lower guide.
 - g. Handles to assist with opening and close of door included.
 - h. Carrier pins at the top pivots, intermediate and end carrier support the full door weight and this is where panels are adjusted.
 - i. A pin locking system is used to lock vertical adjustment once heights are set.
 - j. Pivots at the jamb allow simple screwdriver adjustment of the system horizontally up to 3/8 -inch (10mm).
 - k. All screws fully concealed for external security.
 - l. Hardware finish: As selected by Architect from full range of available finishes.

- m. Adjustment: Provide system capable of specified amount of adjustments without removing panels from tracks, **3/8 -inch (10 mm)** both vertically and horizontally with flathead and Phillip's head screwdriver.
 - n. Gaps between folding panels that accommodate weather stripping and hinges to be **3/16 -inch (5mm)** or less when panels are closed.
 - o. Exclusions:
 - 1) Weight of panels to be borne by the bottom of the guide channel in the sill will not be allowed.
 - 2. Carriers:
 - a. Provide upper guide carriage and lower running carriage with four vertical stainless steel wheels and two horizontal polyamide plastic wheels.
 - b. The vertical wheels to ride on top of sill track and lie above the water run-off level.
 - c. All running carriages to be with sealed, self-lubrication, ball bearing multi-rollers.
 - d. Carriers at intermediate spacing, as necessary for size and weight of partition, to ensure secure, easy, and quiet operation.
 - e. Extruded aluminum material
 - f. Surface mounted hinges and running carriages will not be allowed.
 - 3. Threshold: Standard raised.
 - a. Material: Extruded aluminum
 - b. Finish: As selected by Architect to match related door hardware.
 - c. Adjustment: Provide system capable adjustments without removing panels from tracks, **3/8 -inch (7 mm)** both vertically and horizontally with flathead and Phillip's head screwdriver.
 - d. Gaps between folding panels that accommodate weather stripping and hinges to be **3/16 -inch (5mm)** or less when panels are closed.
 - 4. Hinges:
 - a. Architectural grade stainless steel used for hinge pins, carrier pins and carrier bogeys.
 - b. Provide stainless steel security hinge pins with set screws.
 - c. Provide three (3) hinges on panels **96 -inch** or less and four (4) hinges on panels taller than **96 -inch**.
 - 1) Provide wall pivots for jamb side pivot panels for taller doors or high-wind environments.
 - 5. Adjustment: Provide hardware capable of specified amount of compensation and adjustments without needing to remove panels from tracks, in width, **1/16 -inch (1.5 mm)** per hinge and in height, **1/16 -inch (2 mm)** up and down.
- H. Other Components:
 - 1. Weather stripping:
 - a. NANA Wall: Provide manufacturer's standard double layer EPDM or brush seals with a two layer fiber glass reinforced polyamide fin at both the inner and outer edge of door panels or on frame for sealing between panels and between panel and frame.
 - b. LaCantina: Weather stripping: Provide manufacturer's standard seals at the inner and outer edge of door panels or on frame for sealing between panels and between panel and frame.
 - 1) Color: Dark bronze.

2. Provide manufacturers optional door sill sweep mounted at exterior face of door sill.
3. Provide stainless steel screws for connecting frame components.
4. Provide magnetic door stop for main entry swing panel.

2.4 GLAZING

- A. Glass and Glazing System: Comply with Division 8 Section "Glazing" for safety glass, insulating-glass units, laminated glass, and glazing requirements applicable to glazed folding/sliding aluminum-framed glass doors.
- B. Glass:
 1. Comply with Division 8 Section "Glazing" for requirements applicable to safety glazing and insulating-glass units.
 2. Glazing product:
 - a. Refer to Section 08 8013 "Exterior Glazing" for insulated glazing type

2.5 FABRICATION

- A. Use extruded aluminum frame and panel profiles with male-female interlocking, corner connectors and hinges, folding hardware, locking hardware and handles, glass and glazing and weather stripping as specified herein to make a folding glass wall.
 1. Factory pre-assemble as is standard for manufacturer and ship with all components and installation instructions.
- B. Sizes and Configurations: See drawings for selected custom dimensions within maximum frame sizes possible as indicated in manufacturer's literature.
 1. See drawings for selected number of panels and configuration.
- C. Swing/stacking direction: Outward and/or inward opening unit as herein specified and indicated in drawings.
- D. Provide 90 degree zero post corner configurations as per drawings provided.
- E. Fabricate sliding/folding aluminum-framed glass doors in sizes indicated.
 1. Include a complete system for assembling components and anchoring doors.
 2. Factory prepare doors for hardware provided by door manufacturer.
- F. Fabricate sliding/folding aluminum-framed glass doors that are reglazable without dismantling panel framing.
 1. Frame Head and Jamb and Sash Panel horizontal extrusions shall have a nominal minimum wall thickness of 0.094 -inch.
 - a. Master Frame Sill and Sash Panel vertical extrusions shall have a nominal minimum wall thickness of 0.094 -inch.
 2. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
 3. Provide hardware with low conductivity, or provide nonmetallic material for hardware bridging thermal breaks at frame.

EXTERIOR GLAZED PANEL FOLDING DOORS

- G. Weather Stripping: Provide operable panels with a double row of folding/sliding weather stripping in horizontal rails and single- or double-row weather stripping in meeting or jamb stiles. Provide compression-type weather stripping at the perimeter of each movable panel where folding/sliding-type weather stripping is not appropriate.
 - 1. Provide weather stripping locked into extruded grooves in door panels or frames.
 - 2. Provide additional option Sill Sweep at sill.
- H. Weep Holes: Provide weep holes and internal drainage passages to conduct infiltrating water to exterior.
- I. Factory-Glazed Fabrication: Glaze folding/sliding aluminum-framed glass doors in the factory where practical and possible for applications indicated.
 - 1. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.
- J. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and with glazing system indicated. Provide glazing stops to match panel frames.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Finish / Color is the same at the exterior and interior of panels.
 - 1. Finish: Match finish selected for Glazed Aluminum Curtain Walls, See Section 08 4413.
 - 2. Custom Color and Gloss: Match color selected for Glazed Aluminum Curtain Walls, See Section 08 4413.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - 2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

- B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.
- C. Examine surfaces of openings and verify rough openings are level, plumb, and square, no unevenness, bowing, or bumps on the floor that will affect operation or weathertightness of the folding panel doors.
- D. Because of the large dimensions involved and the weight and movement of the panels, verify the structural integrity of the header such that the deflection with live and dead loads is limited to the lesser of;
 - 1. L/720 of the span and 1/4 -inch.
 - a. Structural support for lateral loads (both wind load and eccentric load when the panels are stacked open) must be provided.
- E. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight folding/sliding aluminum-framed glass door installation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.
- G. Installation of system constitutes acceptance of existing conditions.

3.2 PREPARATION

- A. For folding doors supported by or anchored to permanent construction, advise installers of specific requirements for placement of anchorage devices.
 - 1. Furnish installers of other work with templates and drawings indicating locations of anchorage devices and similar items.

3.3 ERECTION

- A. Because of the large dimensions involved and the weight and movement of the panels, verify the structural integrity of the header such that the deflection with live and dead loads is limited to the lesser of;
 - 1. L/720 of the span and 1/4 -inch.
 - a. Structural support for lateral loads (both wind load and eccentric load when the panels are stacked open) must be provided.

3.4 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
 - 7. Properly flash and waterproof around the perimeter of the opening and frame.

EXTERIOR GLAZED PANEL FOLDING DOORS

- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
 3. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112, Section 5.12 "Dissimilar Materials."
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack, absolutely level, straight, plumb and square.
- F. Installer to provide appropriate anchorage devices and to securely and rigidly fit frame in place, absolutely level, straight, plumb and square.
- G. Install frame in accordance with manufacturer's recommendations and Installation Instructions.
1. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.
 2. Install frame in proper elevation, plane and location, and in proper alignment with other work. Install head section of frame with a 1/8 -inch upward crown at the center of the opening.
 3. Flash and waterproof around the perimeter of the opening and frame to integrate with air and weather barriers of adjacent cladding assemblies to shed all water to the exterior.
 4. Install components to drain condensation, water penetrating joints, and moisture migrating within doors to the exterior.
- H. Standard Floor Clearances: 1/4 -inch to 3/4 -inch (6.4 to 19 mm) maximum (above floor finish).
- I. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.
- J. Install sliding/folding aluminum-framed glass doors level, plumb, square, true to line, without distortion, warp or rack of frames and panels, or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.
- K. Install sliding/folding aluminum-framed glass doors and components to drain condensation, water penetrating joints, and moisture migrating within doors to the exterior.
- L. Seal shim space at frame perimeter with acoustical sealant.
1. Refer to Division 7 for Sealant specification.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Testing Methodology: Testing of folding/sliding aluminum-framed glass doors for air penetration resistance and water resistance will be performed according to AAMA 502, Test Method A, by applying same test pressures required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 2. Testing Extent: Three folding/sliding aluminum-framed glass doors as selected by Architect and a qualified independent testing and inspecting agency. Folding/sliding doors shall be tested immediately after installation.
 - 3. Water-Spray Nozzle Test: After completing the installation of 75-foot (23-m-) by-2-story minimum area of metal plate wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.
- C. Sliding/folding aluminum-framed glass door will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports according to AAMA 502. Testing agency will interpret test results and state in each report whether tested work complies with or deviates from requirements.
- E. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Assemblies will be considered defective if they do not pass tests and inspections. Should failure occur, Contractor shall test one additional unit for each failed location

3.6 ADJUSTING AND CLEANING

- A. Lubricate hardware and moving parts.
- B. Adjust operating panels to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and a weathertight closure.
- C. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.
- D. Clean aluminum surfaces immediately after installing folding/sliding doors. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, and clean surfaces.
- E. Clean glass immediately after installing folding/sliding aluminum-framed glass doors.
 - 1. Comply with manufacturer's written recommendations for final cleaning and maintenance.
 - 2. Remove nonpermanent labels and clean surfaces.

- F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- G. Protect sliding/folding door surfaces from contact with contaminating substances resulting from construction operations.
 - 1. During construction, monitor folding/sliding door surfaces adjacent to and below exterior concrete and masonry surfaces for presence of dirt, scum, alkaline deposits, stains, or other contaminants.
 - 2. If contaminating substances do contact folding/sliding door surfaces, remove contaminants immediately according to manufacturer's written instructions.

3.7 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that exterior panel folding doors will be without damage or deterioration, other than normal weathering, at time of acceptance
 - 1. Protect sliding/folding door surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately according to manufacturer's written instructions.
- B. Refinish or replace exterior panel folding doors with damaged finishes.
- C. Replace damaged components.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain folding doors.

- END OF SECTION -

SECTION 08 3323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Fire Rated Rolling Service Doors: Include all solid slat curtains, bottom bars, guides, brackets, hoods, operating mechanisms and any special features.
 - 1. (Gearhead - Horizontal) Operated Service Door
 - a. Building exterior door at Trash/Recycle room

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 8113 "Sustainable Design Requirements".
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 03 3000 "Cast-In-Place Concrete"
- E. Section 05 1200 "Structural Steel"
- F. Section 05 5000 "Metal Fabrications" for miscellaneous steel supports.
- G. Section 05 4000 "Cold-Formed Metal Framing"
- H. Section 06 1600 "Sheathing" for exterior sheathing at metal stud framed walls.
- I. Section 08 7100 "Door Hardware" for product requirements for cylinder core and keys.
- J. Section 09 2900 "Gypsum Board" for interior gypsum sheathing at metal stud framed walls.
- K. Division 26 Sections specifying electrical connections.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. Department of Fire, Building and Life Safety (DFBLS)
- C. Arizona State Fire Marshal listings.
- D. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- H. NEMA MG 1 - Motors and Generators.
- I. NFPA-80 – Standard for Fire Doors and Fire Windows.
- J. UL Directory or Intertek Testing Services (Warnock Hersey Listed) Directory.

1.5 ACTION SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product Data: For each type and size of overhead coiling door and accessory.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Include construction details, material descriptions, dimensions of individual components, profiles for slats, grilles and finishes.
 - 5. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 6. Provide operating instructions, maintenance information, and electrical rough-in instruction.
- C. Submit manufacturer's product data, roughing-in diagrams, and installation instruction for each type and size of Door.
- D. Shop Drawing: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, details, and attachments to other work.

OVERHEAD COILING DOORS

2. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Interface requirements for Work of other Sections of this Specification.
- E. Samples for Initial Selection: Custom powder coated factory color samples for slats
1. Include similar Samples of accessories involving color selection.
- F. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Curtain Slats/Grille: 12 -inches (305 mm) long.
 2. Bottom Bar with sensor edge: 6 -inches (150 mm) long.
 3. Guides: 6 -inches (150 mm) long.
 4. Brackets: 6 -inches (150 mm) square.
 5. Hood: 6 -inches (150 mm) square.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Submit written certification verifying door assembly ability to support specified loads. Certification shall be prepared and sealed by a structural engineer licensed in the State in which the project is constructed.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- D. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.
- E. Seismic Qualification Certificates: For overhead coiling doors, accessories, and components, from manufacturer.

1.7 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 7700 "Closeout Procedures".
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.
- C. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- C. Door manufacturer:
 1. Shall have at least Ten (10) years experience in manufacturing doors of this type.
 2. Furnish each Overhead Coiling Door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.
- D. Insert and Anchorage's: Furnish drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other Work to avoid delay.
- E. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture.
 1. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.10 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
 1. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.11 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.12 WARRANTY

- A. Non-rated doors: All Doors shall be warranted for a period of two (2) years from the time of Substantial Completion against defects in workmanship and materials.
- B. Rated doors: All Doors shall be warranted for a period of two (2) years from the time of Substantial Completion against defects in workmanship and materials.
- C. Warranty: Manufacturer's limited door and operators System warranty of all parts and components of the system except counterbalance spring and finish for Three (3) years or 20,000 cycles, whichever comes first.

OVERHEAD COILING DOORS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Operation Frequency: All rolling insulated service doors shall be designed to a standard maximum of 25 cycles per day and an overall maximum of 50,000 operating cycles for the life of the door.
- D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- E. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
 - 1. Design Wind Load: As indicated on Drawings.
 - a. Windlocks shall be installed on 20 gauge exterior slat doors over **12 -feet 1 -inch** wide and on 16 gauge exterior slat doors over **14 -feet 1 -inch** wide unless required otherwise by door manufacturer for either rated or non rated door assemblies.
 - 2. Testing: According to ASTM E 330 or DASMA 108 for garage doors and meeting the acceptance criteria of DASMA 108 .
 - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
 - 4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of **20 lbf/sq. ft. (960 Pa)** wind load, acting inward and outward.
- F. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - 2. Component Importance Factor: 1.0.
- G. Fire Rated Assemblies:
 - 1. Provide assemblies complying with NFPA 80 and listed in UL Directory or Intertek Testing Services (Warnock Hersey Listed) Directory.

2.2 FIRE-RATED DOOR ASSEMBLY

- A. Fire-Rated Service Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide **FireKing® Series, Model 631 Fire-Rated Rolling Service Doors** by **Overhead Door Corporation**, (800) 275-3290, www.overheaddoor.com, or comparable product by one of the following:
 - a. Cookson Company.
 - b. Cornell Iron Works, Inc.
 - c. McKeon Rolling Steel Door Company, Inc.
 - d. Wayne-Dalton Corp.
- B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.
- C. Fire Rating: 1-1/2 hours Class A label with temperature-rise limit and with Heat Detectors instead of smoke control.
- D. Automatic Closure: UL approved release mechanism equipped with a 165 degree F fusible link.
1. Time-delay release mechanism as added safety control: Series: Fire Sentinel
 - b. Model: FSAFCBVB
 - c. Features:
 - 1) Release time delay: Factory set at 10 seconds and field adjustable to either; 20, 30 or 60 seconds.
 - 2) Unit shall support two (2) or four (4) Heat detectors
 - 3) Unit shall support a two (2) or four (4) smoke detector system, maximum of 4 Class B style A detectors. (Release devices are normally open contacts)
 - a) Confirm application with Architect.
 - 4) Unit shall have two (2) 12 VDC batteries wired in series for 24 VDC output.
 - 5) Unit interacts with electric safety edge
 - 6) Unit shall be wired into electric operator to drive door close on alarm.
 - a) If the electric edge is activated by an obstruction in the opening, unit will open the door and reinitiate closing for three (3) cycles.
 - b) If the obstruction is not removed by the fourth cycle, unit will stop door on the obstruction and remain at that point until the obstruction is removed and then will activate operator to close door.
 - c) Unit shall be supplied with a combination ADA Horn/Strobe combination and a test/reset keyswitch. (Keyswitch allows unit to be tested without activation of the alarm system, smoke detector or heat detector) – Confirm application with Architect.
 - d) Central Fire Alarm: Electric Release Mechanism operated from the fire alarm system.

- e) Electric operator shall be modified to accept Fire Sentinel.
- f) Load Rating: Support and Release **40 lbs.** maximum.
- g) Power Loss Time Delay: 48 hours
- h) Box dimension: **10 –inches** by **10 –inches** by **5 –inches** deep.

- E. Air Infiltration: Maximum rate of **0.08 cfm/sq. ft. (0.406 L/s per sq. m)** at **15 mph and 25 mph (24.1 and 40.2 km/h)** when tested according to ASTM E 283.
- F. Smoke Control: Provide UL labeled smoke protection. Comply with UL label for "Leakage Rated Assembly" or "S" label.
 - a. Comply with NFPA 104 air leakage requirements
 - b. Pass UL test procedure 1784
 - c. Manufacturer's factory provided Smoke Seals.
- G. Door Curtain Material: 24 gauge Galvanized steel interlocking roll-formed slats.
- H. Door Curtain Slats: Flat profile slats at **2 5/8-inch** (67-mm) center-to-center height by **5/8 –inch** thick.
 - 1. Model: F-265 (Flat)
- I. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
 - 1. Description:
 - a. Face of Wall Rolled Guides: Continuous Rolled steel Guide secured to continuous steel bent plate which is secured to wall support framing. Designation: Type "E" or Type "Z", refer to Drawings
 - 2. Finish:
 - a. PowerGuard Zinc finish for guides, bottom bar and head plates.
- J. Pass Door(s): None .
- K. Bottom Bar: Two galvanized structural steel angles with PowerGuard Zinc finish, **1 1/2-inch** by **1 1/2 -inch** by **1/8 –inch (38 mm by 38mm x 3 mm)**.
- L. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to **0.03 –inch** per **foot** of span.
 - 1. Counterbalance shall be adjustable by means of an adjusting tension wheel.
- M. Hood: 24 guage Galvanized steel .
 - 1. Shape: Round.
 - 2. Mounting: Face of wall.
 - 3. Brackets: to support counterbalance, Curtain and hood. Hot rolled steel with PowerGuard zinc finish. Locking Devices: Equip door with locking device assembly. Confirm locking requirements with Architect.
 - 2. Locking Device Assembly: Single-jamb side locking bars, operable from Cylinder lock inside and outside for electric operation with interlock switch. Confirm locking requirements with Architect.

O. Electric Door Operator:

1. Series: RMX, Overhead Door Co.
2. Model: RG
3. HP: 1/2
4. Resetting: Floor Resettable Electric Motor Operation
5. Usage Classification: Standard Duty up to 60 cycles per hour during peak usage periods. Operator Location: Wall Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 -feet (2.44 m) or lower.
8. Motor Exposure: Exterior, wet, and humid. Emergency Manual Operation: Chain type Obstruction Detection Device: Automatic Monitored electric sensing edge for monetary contact controls. Sensor Edge Bulb Color: Black Control Station(s): Interior mounted and Exterior mounted Push button controls at Interior side
 - b. Key control at exterior side

P. Curtain Accessories: Equip door with smoke seals, automatic closing device,

Q. Door Finish:

1. Powder-Coated Finish: PowerGuard,
 - a. Custom color as provided by Architect.
2. Factory Prime Finish: Manufacturer's standard color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
 1. Install motor assembly with approved Acoustical Isolators such as Mason BR Isolators or equivalent.
- B. Install overhead coiling grille doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

OVERHEAD COILING DOORS

- D. Department Access: Install overhead coiling grilles, switches, and controls along routes and as approved by Fire Marshall and in compliance with regulatory requirements.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.4 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-grille Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for grille operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Perform maintenance, including emergency callback service, during normal working hours.
 2. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

- END OF SECTION -

- SECTION 08 3513 -**HORIZONTAL SLIDING ACCORDION-TYPE FIRE
DOORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes;
 - 1. Furnish and install Single Horizontal Sliding, Accordion-type Fire Doors as shown on the drawings and specified.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 05 4000 "Cold-Formed Metal Framing"
- D. Section 05 5000 "Metal Fabrications" for support of and blocking for partition tracks, jamb conditions, pocket doors, motor operators, and controls; and for prepunching metal support members.
- E. Section 08 3100 "Access Doors and Frames" for access panels to controls of fire-rated folding doors.
- F. Section 09 2900 "Gypsum Board"
- G. Section 09 9123 "Interior Painting" for prepping, priming and painting door track, soffit, chain guide and wall mounted striker posts which are not factory painted.
- H. Division 26: All electrical wire, wiring, conduit and electrical boxes shall be furnished and installed by electrical section.
- I. Division 28: Access control system for fire-alarm and activating signaling systems.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. National Electrical Code / NFPA 70 2008, with City of Phoenix administrative provisions and amendments.
- C. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- D. OSHA Occupational Safety & Health Administration
- E. Manufacturer's recommendations and specifications.
- F. NFPA – National Fire Protection Agency
 - 1. NFPA 80, Chapter 9
 - 2. NFPA 101
 - 3. NFPA 252
- G. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
 - 1. UL 1784 for Smoke Label
 - 2. UL 10B for fire ratings up to 90 minutes
 - 3. UL 864 for Automatic closing system and incompliance with NFPA 80, Chapter 9
 - 4. UL R6799

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for folding doors.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings: For folding doors.

1. Include plans, elevations, sections, details, attachments to other work, clearances required for operation, electronic operating and control mechanisms, access requirements, pockets and pocket doors, and accessory items.
 2. Include installation details and show blocking.
 3. Include clearances required for operation, operating and control mechanisms, access requirements, storage pockets and pocket doors, and accessory items.
 4. Fire-Release System: Describe system, including testing and resetting instructions for fire-rated folding doors.
 5. Include diagrams for power, signal, and control wiring.
 6. Fire-Release System: Describe system, including testing and resetting instructions.
 7. Indicate required stacking depth, storage pocket width and height of header above finished floor. Show installation details, layout, and electrical requirements.
 8. Wiring Diagrams: For power, signal, and control wiring.
 9. Hardware, track, carriers, seals, fire release, and other operating components.
 10. Electric operator.
- F. Setting Drawings: For anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete or masonry, and for cutouts required in other work, including support-beam punching template.
- G. Samples: For each exposed product and for each color and texture specified.
- H. Samples for Initial Selection: For each type of exposed finish.
1. Include Samples of hardware and accessories involving color and finish selection.
- I. Samples for Verification: For each type of exposed finish.
1. Include Samples of hardware and accessories to verify color and finish selection.
- J. Product Schedule: For folding doors.
1. Use same designations indicated on Drawings.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: For each type of finish, covering, or facing indicated.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-rated folding doors.
- D. Product Test Reports: For each fire-rated folding door, for tests performed by a qualified testing agency.
- E. Evaluation Reports: For fire-rated folding doors, from ICC-ES
- F. Operation and Maintenance Data: Operating manual, troubleshooting and repair methods, and wiring diagrams shall be provided as part of project close out procedure.

1.8 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.
- C. Operation and Maintenance Data: For folding doors to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
 - 1. Finishes, coverings, or facings for folding doors, including finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 1. Installation shall be performed by factory trained and certified installers with a minimum of three (3) years experience installing accordion-type fire doors.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Fire-Rated Folding Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to UL 10B, UL R6799 and ASTM E-2074.
 - 1. Fire doors shall be listed by Underwriters Laboratories for ratings as indicated, when tested in accordance with the requirements of UL 10B, NFPA 252 and ASTM E-2074.
 - 2. Automatic closing system shall be listed by Underwriters Laboratories in accordance with the requirements of UL 864 and be intended for use with assembly in compliance with NFPA 80, Chapter 9, including Section 9.4.2.1.
- D. Fire doors used for smoke and draft control shall bear the "S" mark on the fire door label and shall have an air leakage of less than **3 ft³/ft²** at **0.1 -inch** of water column pressure when tested in accordance with UL 1784 with an artificial bottom seal.
- E. Fire doors used at the point of access to an elevator shall bear the "SE" mark on the fire door label and shall have an air leakage of less than **3 ft³/ft²** at **0.1 -inch** of water column pressure when tested in accordance with UL 1784 without an artificial bottom seal.
- F. Fire doors shall be capable of resisting an air pressure differential up to **.05 -inches** of water column. Air pressure resistance to 0.1 inches of water column available.
- G. Pocket Door: Maintain full pocket clear width when separate pocket door is open.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install folding doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication
- C. Deliver to the job site in manufacturer's original, unopened package.
- D. Store boxes flat (not more than three high) in a dry area and protect from elements that may damage materials. Replace damaged materials at no cost to the owner.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver to the job site in manufacturer's original, unopened package, labeled to show name, brand and type.
- C. Store boxes in a dry location.

1.12 COORDINATION

- A. Coordinate the efforts of the various trades affected by the work of this section.
 - 1. Assure accurate installation of header, jamb, and trim.
 - 2. Provide field dimensions for fabrication. Supervise unloading and handling of materials.
 - 3. Fire Alarm system.
 - 4. Electrical.
 - 5. Floor and ceiling finish.
 - 6. Panel pocket doors finish and wood veneer paneling when applicable.
- B. Assure accurate installation of header, jamb, and trim.
 - 1. Provide field dimensions for fabrication.
 - 2. Supervise unloading and handling of materials.
 - 3. Provide "As-Built" dimensions for opening and storage pocket.
- C. Permanent power shall be in-place and ready for final connection when fire doors are erected. Assure access to and proper clearance for motor operators.
- D. After testing the fire alarm system, automatic-closing fire doors shall be re-set to the original positions.
- E. Store boxes flat (not more than three high) in a dry area and protect from elements that may damage materials. Replace damaged materials at no cost to the owner.
- F. Permanent power shall be in-place and ready for final connection when fire doors are erected. Assure access to and proper clearance for motor operators.

- G. After testing the fire alarm system, automatic-closing fire doors shall be re-set to the original positions.

1.13 WARRANTY

- A. Materials and installation shall be warranted against defects in workmanship for a period of two (2) year from the date of substantial completion.

1.14 TRAINING

- A. A comprehensive owner training seminar to be conducted by a factory trained, service technician, per Section 01 7900 "Demonstration and Training".
 - 1. The owner training shall include horizontal sliding, accordion-type fire door operation, care, maintenance, testing and trouble-shooting.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 MANUFACTURER

- A. Horizontal sliding, accordion-type fire doors.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following :
 - 2. Basis of Design:
 - a. Subject to compliance with requirements, provide Single Horizontal Sliding Accordion-type Fire Doors, **FireGuard Cross Corridor Model FG –CC 90** as manufactured by **Won-Door Corporation**, Salt Lake City, Utah, www.wondoors.com. or comparable product by one of the following:
 - 1) Cornell Iron Works, Inc.
 - 2) McKeon Rolling Steel Door Company, Inc.
 - 3) Products of other manufacturers demonstrating complete compliance with each of the fire rating and performance criteria of the product specified will be considered for approval. Minimum proof of compliance shall include UL test report and independent testing agency report documenting compliance with IBC Section 1008.1.3.3 and NFPA 80, Chapter 9.

2.3 HORIZONTAL SLIDING ACCORDION-TYPE FIRE DOOR

- A. Description: Electrically powered and operated self-closing folding-door assembly, with egress capability, automatic or self-closing, listed and labeled for fire-resistance ratings indicated by a qualified testing agency, top supported, and complete with hardware, seals, track, closing devices, releasing devices, controls, and accessories necessary for intended operation.

HORIZONTAL SLIDING ACCORDION-TYPE FIRE DOORS

1. Rating: 90 minute
- B. Listed Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to NFPA 252, UL 10B and UL R6799.
 1. Oversize Doors: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- C. Configuration: As indicated on Drawings .
 1. Closing and Opening Operation: Automatic Closing System shall be a Microprocessor-based system rated to UL864 (Releasing Device Control Units and Accessories for Fire Alarm Systems) and shall commence closing upon activation by fire alarm system and/or by low battery charge.
 - a. Obstruction Detection: Contact with an obstruction shall cause the door to stop, reverse enough to remove pressure on the leading edge, pause, and then re-close when in an alarm condition.
 - b. While the door is opening under motor power, constant pressure to the leading edge in the direction of opening shall cause the door to continue to open until the leading edge is released.
 - 1) This is termed motor-assisted opening.
 - c. Constant pressure to the leading edge while not under motor power shall prevent motor operation and allow the door to be opened manually.
- D. Exit Hardware Operation: Provide fire exit hardware on both sides of door.
 1. In emergency mode, a slight pressure on the hardware will cause the door to open a minimum of **32 -inches**, pause for 3 seconds, and then automatically close.
 2. The open distance shall be field programmable, up to the entire opening width, if the local authority requires an opening larger than **32 -inches**.
 3. The pause before re-close shall be field programmable, up to 30 seconds, if the local authority requires a longer pause time.
 4. The exit hardware shall have the ability when not in the emergency (fire) mode or the security (lock) mode to be used to open the door and move it back into the storage pocket.
 5. The exit hardware shall have the ability when not in the emergency (fire) to be used to open the door and move it back into the storage pocket.
 6. The exit hardware shall be field programmable to provide access control.
 - a. When programmed, the exit hardware shall not respond when pressed until activated by signal from smoke detector or fire alarm.
- E. Door / Panel Construction: Formed-galvanized-steel or formed-steel sheet panels connected by hinges of matching material.
 1. Shall consist of two parallel, accordion-type walls of panels independently suspended with no floor tracks, pantographs, or interconnections except at the lead-post.
 2. Panels: **24 gauge** steel, V-grooved; Modular design; Capable of in-place repair.
 3. Perimeter Seals: shall consist of continuous extruded vinyl sweeps attached to the top and bottom of the fire door to form a smoke and draft seal.
 4. Hanging Weight: **5.5 pounds** per **sq. ft.** when extended across the opening.
 5. Finish: All steel parts factory-applied enamel.

6. Color: Manufacturer's standard platinum.
- F. Suspension System: Two tracks, on 8 -inch centers, attached to overhead structural support.
1. Tracks: 14 gauge cold rolled steel or .125 -inch thick aluminum.
 2. Panel Hangers: Every other panel individually is suspended by a steel hanger pin and a ball bearing roller.
 3. Lead Post Hangers: 16 gauge steel structural tube frame with 18 gauge steel preformed cover.
 - a. The lead post shall function as an integrated cover panel over the storage pocket opening when the fire door is in the open position
 4. Rated Header Assembly: See "Rated Header Assembly" paragraph below.
- G. Rated Header Assembly:
1. FG-CC Series: Unitized Track system with self supporting track, threaded rods and mechanical attachment hardware.
 - a. No added gypsum board or plywood required.
- H. Perimeter Seals and Closures: Manufacturer's standard vinyl or neoprene vertical seals, horizontal top and bottom seals, and closures identical to products tested for fire rating indicated, and forming an effective smoke and draft seal.
1. Points of Access to Elevators: Provide smoke seals that comply with requirements of authorities having jurisdiction for seals at points of access to elevators where indicated.
- I. Lead Posts: Formed from not less than 0.026-inch (0.66-mm-) thick steel sheet, connected to door panels by specially adapted panels and equipped with manufacturer's standard handle on each side.
1. FG-CC Series: Pocket door is integrated into Lead Post of fire door
- J. Features:
1. Track and Trolley system:
 - a. Overhead track without floor guide.
 - b. Dual steel or aluminum track systems, with ball-bearing roller trolleys and adjustable steel hanger rods for overhead support; designed for type of operation, size, and weight of fire-rated folding door indicated.
 - 1) Provide a continuous system of track sections and accessories identical to products tested for fire rating indicated
 2. Normal Position:
 - a. Assembly's normal position is the open (stacked) position. Signal from fire-alarm system initiates self-closing operation.
 3. Manual Operation:
 - a. Allow manual operation in either conventional or emergency mode.
 - 1) When opened manually during emergency mode, control mechanism automatically closes assembly.
 4. Access Control/Monitoring:
 - a. Exit hardware does not respond until activated by signal from smoke detector or fire alarm
 5. Non-Sway Construction: To resist differential air pressure.

2.4 ELECTRIC OPERATORS

1. Operators: Factory-assembled power-drive unit consisting of motor, remote-located control panel, limit switches, torque-limiting devices, clutch, reversing magnetic motor operator, leading-edge obstruction detectors, and key-switch control for conventional operation.
 - a. Motor: In horsepower required for proper operation of door height and weight, but not less than **1/2 hp**, controlled by reversing magnetic starter and equipped with overload protection.
 - b. Limit Switches: To prevent overtravel.
 - c. Roller Chain or Cable: Connected to lead posts by means of vertical stabilizer bar assembly.
 - d. Drive Mechanism: Protected by torque limiter and emergency clutch.
 - e. Travel Speed: **18 -inches (450 mm)** per second, maximum; **6 -inches (150 mm)** per second, minimum.
- B. In case of fire, closing system is activated by building's fire- and smoke-detection equipment and automatically closes fire-rated folding doors.
- C. Electrical Service: Equip for 120 V, single phase, 60-cycle ac.
- D. Battery: Electrical current (120 V AC) connects through relay to battery charger that continuously charges a maintenance free 12-Volt DC battery and automatically maintains battery at capacity.
 1. Automatic audible signal device sounds off if battery falls below or exceeds proper charge, power loss has occurred, or high-ac line voltage has been experienced.
- E. Leading-Edge Obstruction Detector:
 1. Equip with pressure-sensitive leading edge that, on contact with an obstruction, causes door to stop and pause before attempting to re-close. Shall be pressure sensitive such that each contact with an obstruction shall cause the door to stop, reverse enough to remove pressure on the leading edge, pause, and then re-close when in an alarm condition. The leading edge obstruction detector shall be fully functional at all times, including during the initial closing cycle.
 - a. Constant pressure to the leading edge in the direction of opening shall, while the door is opening under motor power, continue to open under motor power until the leading edge is released. This is termed motor assisted opening.
 - b. Constant pressure to the leading edge while not under motor power shall prevent motor operation and allow the door to be opened manually.
 2. Disable leading-edge obstruction detector until fire-rated folding door has opened pocket door.
- F. Fire-rated folding doors can be manually opened by pushing against leading edge.
- G. Audible alarm sounds at automatic closing of door.

2.5 ACCESSORIES:

- A. Exit Hardware: Located on both sides of fire-rated folding door. In emergency mode, slight pressure on hardware causes door to open a minimum of 32 inches (**812 mm**), pause for 3 seconds, and then automatically close. Furnish hardware that can be field programmable to

allow automatic opening distances of up to the entire opening width. In conventional mode, hardware is used to operate door and move it back into storage pocket.

1. The open distance shall be field programmable, up to the entire opening width, if the local authority requires an opening larger than 32 inches.
2. The pause before re-close shall be field programmable, up to 30 seconds, if the local authority requires a longer pause time.
3. The panic hardware located on the inside (stairwell side) is always operable from the inside.
4. Access Control Type: The exit hardware shall not respond when pressed until activated by signal from smoke detector or fire alarm. Upgrades to the fire door for this level access control shall include a heavy-gauge steel sliding jamb and rigid jamb stops.

B. Pocket Door:

1. FG-CC Series: Supplied by Fire door manufacturer:
 - a. Door is fixed panel integrated into the Leading edge Post of door.
 - b. Face Material: Factory installed metal panel.
 - c. Face Finish: Field match adjacent finish of wall in open position with painted if wall is painted or wall covering if wall covered.

C. Vision panels: When indicated in drawings

2.6 SYSTEM CONTROLS

- A. Wiring: Provide one (1) USOC RJ14-6POS 4 wire jack shall be supplied at the back of the storage pocket and shall be tied to the 4 square junction box adjacent to the door with CAT 3 twisted 2 pair cable. The junction box, RJ14 jack and wire shall be furnished and installed under Division 26 of this Project Manual. Termination to the LCD panel shall be by punch down block and shall be per the manufacturer's written instructions, then the CAT 3 twisted 2 pair cable can be terminated in parallel with the ASL wiring in the same USOC RJ14-6POS 4 wire jack.
- B. Automatic Closing System shall consist of the following:
 1. A door control momentary rocker switch shall be mounted on one side of the door near the lead post and shall have the following functions:
 - a. Pressing the upper portion of the switch shall close the door and/or clear fault conditions.
 - b. Pressing the lower portion of the switch shall open the door and/or temporarily mute the local horn.
 - c. For doors using wall mounted key switches, option L, a color coordinated cover plate shall be provided to fill the hole left when the rocker switch is removed.
 2. The control box shall be equipped with a service switch that performs the following functions:
 - a. When the switch is off with AC power present, the controller shall emit an audible coded sound indicating the system is out of service. In this mode all normal functions shall cease including motor and communications.
 - b. When the switch is off and AC power is not present, the controller shall enter a sleep mode during which the system shall use the battery to monitor the AC line for power but do nothing else.

- c. When the switch is moved from the off position to the on position, the controller shall enter a calibrate mode where it emits a coded audible alert indicating that the door needs to be closed to complete the calibration sequence. As soon as the door is closed, the controller shall automatically stop the audible alert, and resume all normal functions and monitoring.
- 3. Microprocessor based Electronic Control box with these features:
 - a. Ability to monitor dual power sources continually for peak performance including:
 - 1) Detect a missing battery, bad battery, or low battery condition.
 - 2) Detect if the charging circuit is bad.
 - 3) Detect fuse failures.
 - 4) Detect high or low AC conditions.
 - b. Ability to monitor the health of the drive train including:
 - 1) Direction errors, obstruction errors, hindrance errors, and position errors.
 - 2) Active daily path checks, by actually closing and opening to assure a clear path and proper operation.
 - 3) Ability to monitor a passive input such as an infrared light beam to assure the closing path is clear.
 - c. Ability to monitor inputs including:
 - 1) Sticky door block, exit hardware, patron hardware, and key switches.
 - 2) Key switch mis-wires where key open and key close are both on simultaneously.
 - d. Ability to self-monitor the health of:
 - 1) Internal volatile and non-volatile memory.
 - 2) Proper operation of firmware.
 - e. Ability to run a "watch dog" monitoring circuit which will force a software restart in the event the software hangs, including the ability to track the number of resets that occur for diagnostic purposes.
 - f. Ability to record the number of times the door has closed, opened, lost communication with external microprocessors, and the number of times the controller has been reset manually.
 - g. Ability to monitor ambient temperature and lockout the operating devices once the environment at the door becomes untenable.
 - h. Ability to enter a security mode to help control access through the door including:
 - 1) The ability to automatically re-close and secure itself after a legitimate patron access has occurred.
 - 2) The ability to unlock and revert to a fire door in a fire alarm condition, including the ability to re-lock automatically after the fire alarm condition has cleared.
 - i. Ability to withstand voltages up to 120 volts AC on the fire alarm input circuit without damage including the ability to indicate that the alarm circuit has not been wired as a dry contact, "no voltage" circuit when errant voltages are applied to the circuit.
 - j. Ability to communicate with other microprocessors on the system via an internal bus system, including but not limited to microprocessors on the motor drive, in the leading edge of the door, and on a wall mounted display panel adjacent to the door.

- k. Ability to indicate trouble or supervised information both locally and at a remote location. Communication to the remote location shall be by either relay logic or digital data streams to our proprietary ASL system (see options).
 - 4. Motor Operator Assembly including: A DC gear motor, drive sprocket, clutch, and position sensors. The motor shall drive the fire door by means of a chain attached to a stabilizer bar trolley. The motor shall be rated for continuous use with unlimited cycle duty.
 - 5. A door control momentary rocker switch shall be mounted on one side of the door and shall function as follows:
 - a. Pressing the upper portion shall close the door and/or clear fault conditions.
 - b. Pressing the lower portion of the switch shall open the door and/or temporarily mute the local horn.
 - 6. Leading Edge Obstruction Detector shall be pressure sensitive such that contact with an obstruction shall cause the door to stop, pause for three (3) seconds, then re-close when in alarm mode. The obstruction detection system shall be fully functional at all times.
 - 7. Exit Hardware shall be located on both sides of the fire door.
 - 8. Doors installed at the point of access to an elevator ("E" label) shall include the following extras: track seals, anti-sway brackets every five feet or less across the opening, and foil tape between the panels and the smoke liner.
- C. Header Assembly: provide as an integrated part of the fire door assembly including integrated self-supporting track, threaded rods, and mechanical attachment hardware.
- D. Audible alarm sounds at automatic closing of door.

2.7 RELATED CONSTRUCTION

- A. Track Support Construction: Provide supports attached to structure and mounting surface for tracks including drilling and placement of anchorage points into pre or post tensioned decks, welding, punching and drilling of steel members, and all drywall work; comply with door manufacturer's instructions and recommendations.
- 1. Headers, if furnished & installed by the general contractor or other sections, shall be parallel with the finished floor within $\pm 1/8$ inch tolerance over the entire length of the opening.
- B. Pocket Construction: Provide pocket for concealment of accordion folding fire door when open; comply with door manufacturer's instructions and recommendations to ensure pocket and soffit are built to the dimensions specified, plumb and level.

2.8 FINISHES

- 1. Factory-applied polyester or powder-coat finish for panels and hinges in colors as selected by Architect from manufacturer's full range .
- 2. Manufacturer's standard finish for handles.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of folding doors.
- B. Verify that headers are level with finished floor to within plus or minus 1/16-inch (1.6-mm) tolerance over the length of opening.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. For folding doors supported by or anchored to permanent construction, advise installers of specific requirements for placement of anchorage devices. Furnish installers of other work with templates and drawings showing locations of anchorage devices and similar items.
- B. Fire-Rated Folding Doors: Level floor with header in path of fire-rated folding doors to tolerance of plus or minus 1/16 -inch (1.6 mm) across opening; grind or fill floor as necessary.
 - 1. Coordinate with finish flooring materials.

3.3 INSTALLATION

- A. General: Install folding doors complying with manufacturer's written installation instructions.
 - 1. Install track in one piece.
 - 2. Comply with NFPA 80 for installing fire-rated folding doors.
- B. Standard Floor Clearances: 1/4 -inch to 3/4 -inch (6.4 to 19 mm) maximum (above floor finish).
 - 1. Comply with NFPA 80 for clearances required for fire-rated folding doors.
- C. Fire-Rated Folding Doors: Coordinate provisions for sensing devices, electrical service, and final connections for fire-rated folding doors.

3.4 ADJUSTING

- A. Adjust units as necessary to ensure smooth, quiet operation without warping or binding. Check and readjust operating hardware so latches engage accurately and securely without forcing or binding.
 - 1. Fire-Rated Folding Doors: Verify that all operations are functional and meet requirements of authorities having jurisdiction.
- B. Pocket Doors: Adjust to operate smoothly and easily, without binding or warping.
 - 1. Adjust hardware to function smoothly.
 - 2. Confirm that latches and locks engage accurately and securely without forcing or binding.
- C. After testing the fire alarm system, automatic-closing fire doors shall be re-set to the original positions.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-rated folding doors.
 - 1. A comprehensive owner training seminar will be conducted by a factory trained, service technician. The owner training shall include horizontal sliding, accordion-type fire door operation, care, maintenance, testing and trouble-shooting.
 - 2. A video outlining the operation of the door, scheduled maintenance, basic troubleshooting and care of the door system shall be provided to the owner.
 - a. Refer to Division 1 Section "Demonstration and Training."

- END OF SECTION -

- SECTION 08 3819 -**IMPACT TRAFFIC DOORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes;
 - 1. Impact Traffic Food Service Doors.
 - 2. Hardware and accessories.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 08 8113 "Hollow Metal Doors and Frames" for door frame supplied by others.
- D. Section 09 2216 "Non-Structural Metal Framing" for wall framing.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American National Standards Institute (ANSI)
 - 1. ANSI Z97.1, Safety Performance Specifications and Methods of Test for Safety Glazing Material Used In Buildings.
- C. Manufacturer's recommendations and specifications.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.

- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Operation and maintenance data.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings: Show fabrication and installation details; include door elevations, head, jamb, and meeting stile details including full or partial gaskets.

1.6 INFORMATIONAL SUBMITTALS

- A. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700.
 - a. Submit Installation Instructions from manufacturer.
 - 1) Identify with project name, location and completion date, type and size of unit installed.
- B. Warranty: Submit specified warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Store products in manufacturer's unopened packaging until ready for installation.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. A manufacturer capable of fabricating Impact Traffic Doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications:
 - 1. Installer experienced in the installation of manufacturer's products or other similar products for large openings preferred. Installer to follow Installation Instructions supplied by Manufacturer

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.

1. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Field Measurements: Verify actual dimensions of door openings by field measurements before fabrication.

1.10 WARRANTY

- A. Manufacturer's extended (5) five-year warranty that products are free of defects in material and workmanship, guaranteeing to replace (exclusive of freight and labor) parts proven defective within two years after date of shipment to purchaser.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 MANUFACTURERS

- A. Basis of Design: **Easy Swing®**, **Model SCP-8** manufactured by **Eliason Corporation**; Kalamazoo, MI 49003, Email: doors@eliasoncorp.com, web: www.eliasoncorp.com and www.restaurantdoors.net.

2.3 IMPACT TRAFFIC DOORS

- A. Food Service Doors:
 1. Body: **3/4 -inch (19 mm)**, 7-ply exterior grade solid wood core.
 - a. **1 -inch (25 mm)** total thickness; light to medium duty.
 2. Facing:
 - a. Material: Decorative plastic laminate each side.
 - b. Thickness: **.032 -inch** thick
 - c. Finish: Architect shall select from manufacturers full range of Woodgrain and Solid Colors
 3. Edge Cap:
 - a. Application: Top and strike edge of door.
 - b. Material: 18 gauge (1.27mm) stainless steel
 4. Back Channel:
 - a. Application: Hinge edge of door.
 - b. Material: 18 gauge (1.27mm) stainless steel
 5. Base Kick-Plates:
 - a. Application: Both sides of door.
 - b. Material: 18 gauge (1.27mm) stainless steel with stainless steel edge trim and top hinge covers.

- c. Size: 18 -inches (457 mm) high x door width.
- 6. Window:
 - a. Size: (Architect shall select from the following)
 - 1) 20 -inch round.
 - b. Molding: Black rubber molding.
 - c. Glazing: Clear acrylic.

2.4 HARDWARE AND ACCESSORIES

- A. Hinge:
 - 1. Series: Eliason 'Easy Swing Hardware'
 - 2. Type: Double Action proprietary hinges.
 - 3. Accessory: Stainless steel cover plate each side of door
- B. Bottom Pivot:
 - 1. Material: Stainless steel
- C. Jamb Guards:
 - 1. Material: Stainless steel
 - 2. Size: 3 -inches by 9 -inches tall
- D. Spring Bumpers:
 - 1. Application: Each side of door.
 - 2. Material: Flexible, impact resistant, thermoplastic material.
 - 3. Color: As selected from manufacturers full color range by Architect
- E. Bumper Strips:
 - 1. Application: Use at point of impact for décor protection
 - 2. Material: Extruded aluminum alloy
 - 3. Size: .75 -inches by 1.5 -inches thick
 - 4. Color: Black anodized

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that jambs are plumb and square.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

IMPACT TRAFFIC DOORS

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Minimum jamb construction of double studded wall framing construction or equivalent.
- C. Reinforce hollow metal jambs at hardware locations.
- D. Steel channel jambs are required for heavy duty traffic doors.

3.4 ADJUSTING, CLEANING AND PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Adjust doors for proper alignment, smooth swinging operation and when at rest, door is square in opening.
- D. Clean stainless steel surfaces immediately after installing doors.
 - 1. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging protective coatings and finishes.
 - 2. Remove nonpermanent labels, and clean surfaces.
- E. Clean glazing immediately after installing doors.
 - 1. Comply with manufacturer's written recommendations for final cleaning and maintenance.
 - 2. Remove nonpermanent labels and clean surfaces.
- F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- G. Replace damaged components.

- END OF SECTION -

- SECTION 08 4113 -**ALUMINUM-FRAMED ENTRANCES AND
STOREFRONTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes the following exterior assemblies at ground level not required to be Curtainwall:
 - 1. Manual-swing entrance doors and door-frame units.
- B. Source Limitations: Provide entrance systems by the same manufacturer as Glazed Aluminum Curtain Walls specified in related section.
- C. Work specified in other Sections to be provided by this Section.
 - 1. Entrance door hardware.
 - 2. All hardware items for Aluminum Entrances (Section 08 4113) shall be provided by the storefront supplier, according with the hardware groups and requirements of section 08 7100.
- D. All exterior window locations, refer to Curtainwall Section 08 4413
- E. Interior Storefront, refer to Section 08 4114.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Sections 01 4339 "Mockup Requirements"
- C. Section 01 4553 "Facade Mockup Testing".
- D. Section 07 4215 Metal-Faced Composite Wall Panel Assemblies.
- E. Section 08 4114 "Interior Aluminum-Framed Entrances and Storefront" for interior storefront.

- F. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- G. Section 07 9213 "Exterior Façade Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.
- H. Section 08 4413 "Glazed Aluminum Curtain Walls" for all exterior window openings except those specified in Section 08 3214.
- I. Section 08 7100 "Door Hardware".
- J. Section 08 8013 "Exterior Glazing" for insulating-glass requirements.
- K. Section 08 9000 "Louvers and Vents" for units installed with aluminum-framed systems.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.

1.5 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.6 ACTION SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Shop Drawings: Coordinate with shop drawings for Glazed Aluminum Curtainwall .
 - 1. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- E. Samples for Initial Selection: For units with factory-applied color finishes.

ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

- F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- G. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
 - 2. Submit in accordance with requirements of Section 08 7100.

1.7 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.
- B. Professional Engineer Qualifications: Demonstrate compliance with specified requirements.
- C. Welding certificates.
- D. Qualification Data: For qualified Installer and testing agency.
- E. Preconstruction Test Reports: For sealant.
- F. Energy Performance Certificates: For glazed aluminum entrances, accessories, and components from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum component.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements. For each system provide test reports with shop drawings
- H. Source quality-control reports.
- I. Quality-Control Program for Structural-Sealant-Glazed System: Include reports.
- J. Field quality-control reports.
- K. Sample Warranties: Sample of special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 7700.
- B. Maintenance Data: For aluminum-framed entrances to include in maintenance manuals.
- C. Warranty: Submit specified warranty.

1.9 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Coordinate with meeting associated with Curtain Wall framing.

1.10 QUALITY ASSURANCE

- A. Provide glazed aluminum entrances that comply with test-performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing and tests performed on manufacturer's standard assemblies by a qualified testing agency.
- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of window specialties that are similar to those indicated for this Project in material, design, and extent.
- D. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- E. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this section and who is acceptable to manufacturer.
 - 1. Installer shall have a minimum of five (5) years experience with projects of similar type and scope.
 - 2. Engineering Responsibility: Preparation of data and calculations for aluminum-framed entrances and storefront systems, including the following:
 - a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project and submission of reports of tests performed on manufacturer's standard assemblies.
- F. Preconstruction Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and ICC-ES for preconstruction testing indicated.
- G. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- H. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.
- I. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

- J. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- K. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.11 MOCKUPS

- A. Mockups: Coordinate with Curtain Wall Framing.

1.12 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.13 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum systems correspond to established dimensions.

1.14 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Adhesive or cohesive sealant failures.
 - d. Water penetration.
 - e. Failure of operating components.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace components showing evidence of deterioration of factory-applied within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Delegated Design: Design glazed aluminum entrances, including comprehensive engineering analysis by Contractor's qualified professional engineer, using performance requirements and design criteria indicated.
- C. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - 4. Thermal stresses transferring to building structure.
 - a. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - b. Noise or vibration created by wind and by thermal and structural movements.
 - c. Loosening or weakening of fasteners, attachments, and other components.
 - d. Failure of operating units.
- D. Weather Resistance
 - 1. Refer to Section 08 4413 "Glazed Aluminum Curtain Walls".
- E. Structural Loads:
 - 1. Wind Loads: As specified in Section 01 8316 "Exterior Enclosure Performance Requirements".
 - 2. Seismic Loads: As specified in Section 01 8316 "Exterior Enclosure Performance Requirements".
 - 3. Other Design Loads: As indicated on Drawings.
- F. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Refer to Section 08 4413 "Glazed Aluminum Curtain Walls".
- G. Live Load Deflection: Design shall accommodate differential floor edge vertical movement between successive floors as indicated in Section 01 8316 "Exterior Enclosure Performance Requirements".
- H. Air Infiltration:
 - 1. Refer to Section 08 4413 "Glazed Aluminum Curtain Walls".
- I. Seismic Performance: Structural-sealant-glazed curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and as indicated in Section 01 8316.

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- J. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - 1. Thermal Transmittance (U-factor):
 - a. Refer to and match value in Section 08 4413.
 - 2. Solar Heat Gain Coefficient:
 - a. Refer to and match value in Section 08 4413.
- K. Energy Performance: Certify and label condensation energy performance according to AAMA as follows:
 - 1. Condensation Resistance:
 - a. Refer to and match value in Section 08 4413.
- L. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:
 - 1. Outdoor-Indoor Transmission Class: Minimum 30 .
- M. Sound Transmission Class (STC): Tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
 - 1. Sound Transmission Class: Minimum STC 32.

2.2 ENTRANCE DOOR SYSTEMS

- A. Source Limitations: Obtain all Entrance components and accessories, from single manufacturer, same as that specified in Section 08 4413 for Glazed Aluminum Curtain Walls.
- B. Basis-of-Design Product(s):
 - 1. Basis-of-Design Product: **Series D518 Durastile™ Heavy Duty Entrance** for manual-swing operation as manufactured by **EFCO Corporation**, <http://www.efcocorp.com>.
 - 2. Subject to compliance with performance, sizes and material requirements, provide the named product or a comparable product by one of the following:
 - a. Substitutions: Section 01 2500.
- C. Door Construction: **2-inch** minimum overall thickness, with minimum **0.188-inch** thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or threaded steel tension rods.
 - 1. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 - 2. Door Design: Wide stile; **5-inch (127-mm)** nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within **10 -inches (255 mm)** above floor or ground plane.
 - 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
- D. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: **ASTM B 209 (ASTM B 209M)**.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B 221 (ASTM B 221M)**.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
- C. Fasteners: Aluminum or Series 300 nonmagnetic stainless steel.
 - 1. Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware item being fastened.
- D. Concealed Flashing: Dead-soft stainless steel or extruded aluminum as selected by manufacturer for compatibility with other components.
- E. Brackets and Reinforcements: Aluminum or nonmagnetic stainless steel. Provide non-staining, non-ferrous shims for installation and alignment as required.
- F. Weatherstripping: The weather seals shall be open cell urethane foam core bonded to a U.V. stabilized polyethylene liner. Provide weatherstripping on meeting stiles of pairs of doors and at bottom rail of each door leaf.

2.4 GLAZING

- A. Glazing: As specified in Section 08 8013 "Exterior Glazing"
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
 - 1. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
 - a. Color: As selected by Architect.

2.5 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Exterior Façade Joint Sealants..".
 1. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.
- C. Cleaning Agent and Cloth: As recommended by structural-sealant manufacturer.
- D. Specialty Face caps as specified.

2.6 FABRICATION

- A. General: Fabricate aluminum entrance components to designs, sizes and thickness indicated, and to comply with specified standards.
 1. Sizes and profile requirements are indicated on the drawings.
- B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site. Disassemble components only where necessary for shipment and installation.
 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
 2. Do not drill and tap for surface-mounted hardware items until time of installation at Project site.
- C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.
 1. Welding behind finished surfaces shall be performed to minimize distortion and discoloration on the finished surface.
- D. Reinforcing: Install reinforcing as required for hardware, performance requirements, sag resistance and rigidity.
- E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, suitable sealant, elastomeric tape, or gasket between the surfaces. Do not use coatings containing lead.
- F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members. Fabricate curved members to true shapes as shown on drawings, segmented or faceted curves are not acceptable.

- G. Conceal fasteners wherever possible. Use stainless steel or Stalgard coated fasteners at all wet areas.
- H. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
- I. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- J. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- K. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 DOOR, WINDOW AND FRAME FABRICATION

- A. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, refer to Section 08 4114.
- B. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- C. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- D. Operable Window Frames: Reinforce as required to support loads imposed by window operation and for installing window hardware.
 - 1. Provide compression weather stripping at fixed stops.
- E. Operable Windows: Reinforce as required for installing hardware.
 - 1. At pairs of windows, provide sliding-type weather stripping retained in adjustable strip .

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2.8 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: (Refer to Drawings for specific locations and coordinate with Section 08 4413)
 - a. Dark bronze
 - b. Light Champagne
 - 1. Match Finishes specified in Section 08 4413 for Glazed Aluminum Curtain Walls.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate structural-sealant-glazed systems.
- B. Prepare test and inspection reports.
- C. Structural-Sealant-Glazed Systems: Perform quality-control procedures complying with ASTM C 1401 recommendations, including, but not limited to, system material-qualification procedures, sealant testing, and system fabrication reviews and checks.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Section 08 8013 "Exterior Glazing."
 - 1. Structural-Sealant Glazing:
 - a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - b. Install weatherseal sealant according to Division 07 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Install perimeter joint sealants as specified in Section 07 9213 "Exterior Façade Joint Sealants" to produce weathertight installation.

3.3 OPERABLE UNITS

- A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation, weathertight enclosure and tight fit at weather stripping.
- B. Entrance Doors: Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 -inch in 12 -feet (3 mm in 3.7 m); 1/4 -inch (6 mm) over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 -inch (1.5 mm).
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 -inch (0.8 mm).
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 -inch (3 mm).

3.5 FIELD QUALITY CONTROL

- A. Refer to Section 01 4553 for exterior façade testing requirements.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- C. Testing Services: Refer to Section 08 4413.
 - 1. Air Infiltration: Refer to Section 08 4413.
 - 2. Water Penetration: Refer to Section 08 4413.
 - 3. Water Spray Test: Refer to Section 08 4413.
- D. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- F. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections. Should failure occur, Contractor shall test one additional are for each failed location
- G. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Entrances and Operable Units: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions, providing smooth operation without binding, and to prevent tight fit at contact points and weatherstripping.
 - 1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 -inches (75 mm) from the latch measured to the leading door edge.

3.7 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance

- END OF SECTION -

- SECTION 08 4114 -**INTERIOR ALUMINUM-FRAMED ENTRANCES
AND STOREFRONTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes the following:
 - 1. Interior storefront framing.
 - 2. Interior manual-swing entrance doors and door-frame units.
- B. Source Limitations: Provide storefront and entrance systems by the same manufacturer as Glazed Aluminum Curtain Walls specified in related section.
- C. Work specified in other Sections to be provided by this Section.
 - 1. Storefront and Entrance door hardware.
 - 2. All hardware items for Aluminum Entrances (Section 08 4113) shall be provided by the storefront supplier, according with the hardware groups and requirements of section 08 7100.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Sections 01 4339 "Mockup Requirements"
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 07 9200 "Joint Sealants" for installation of joint sealants.
- E. Section 08 4113 "Aluminum-Framed Entrances and Storefronts" for Entrances"
- F. Section 08 7100 "Door Hardware".
- G. Section 08 8000 "Interior Glazing" for insulating-glass requirements.

- H. Section 09 2900 "Gypsum Board"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.

1.5 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.6 ACTION SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- C. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work. Coordinate with shop drawings for 'Glazed Aluminum Curtain Walls', 'Aluminum-Framed Entrances and Storefronts'.
1. Include details of provisions for system expansion and contraction.
 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
 3. Show connection to and continuity with adjacent wall, floor and ceiling finishes.
 4. Shop drawings shall include project specific integrations to surrounding finishes and other components.
 5. Provide installation instructions and isometric details indicating how system components will be installed and sealed, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
- E. Samples for Initial Selection: For units with factory-applied color finishes.

- F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- G. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12 -inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
- H. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
 - 2. Submit in accordance with requirements of Section 08 7100.

1.7 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.
- B. Professional Engineer Qualifications: Demonstrate compliance with specified requirements.
- C. Preconstruction Mockup Submittals:
 - 1. Preconstruction Testing Program: Developed specifically for Project.
- D. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
- E. Welding certificates.
- F. Qualification Data: For qualified Installer.
- G. Energy Performance Certificates: For glazed aluminum storefronts and entrances, accessories, and components from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum component.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements. For each system provide test reports with shop drawings

- I. Source quality-control reports.
- J. Quality-Control Program for Structural-Sealant-Glazed System: Include reports.
- K. Field quality-control reports.
- L. Warranties: Sample of special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700.
 - 2. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
 - 3. Warranty: Submit specified warranty.

1.9 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site after approval of complete submittals to comply with requirements in Division 1 Section "Project Management and Coordination". Review methods and procedures related to glazed aluminum systems including, but not limited to, the following:
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review adjacent finishes and components and sealants specified in related sections for sequencing and coordination with glazed aluminum systems.

1.10 QUALITY ASSURANCE

- A. Provide glazed aluminum storefronts and entrances that comply with test-performance requirements indicated.
- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- D. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- E. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this section and who is acceptable to manufacturer.
 - 1. Installer shall have a minimum of five (5) years experience with projects of similar type and scope.
 - 2. Engineering Responsibility: Preparation of data and calculations for Aluminum-Framed systems, including the following:

- a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project and submission of reports of tests performed on manufacturer's standard assemblies.

F. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

- 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

H. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.11 MOCKUPS

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. Refer to Section 01 4339 "Mockup Requirements".

1.12 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.13 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum systems correspond to established dimensions.

1.14 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Adhesive or cohesive sealant failures.

- d. Failure of operating components.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace components showing evidence of deterioration of factory-applied within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Delegated Design: Design Interior Aluminum-Framed Entrances and Storefronts, including comprehensive engineering analysis by Contractor's qualified professional engineer, using performance requirements and design criteria indicated.
- C. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Dimensional tolerances of building frame and other adjacent construction.
 - 2. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - 3. Thermal stresses transferring to building structure.
 - a. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - b. Glazing-to-glazing contact.
 - c. Noise or vibration created by wind and by thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Sealant failure.
 - f. Failure of operating units.
- D. Structural Loads:
 - 1. Seismic Loads: As specified in Section 01 8316 "Exterior Enclosure Performance Requirements".
 - 2. Other Design Loads: As indicated on Drawings.
- E. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing

- lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ -inch (19 mm), whichever is less.
- 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or $1/8$ -inch (3.2 mm), whichever is smaller.
- 3. At safety loads of 150 percent of design load for metal members supporting glass, residual deflection of framing members shall not exceed 1/1000th of span.
- 4. Accommodate a minimum $1/2$ -inch live load deflection or greater, as determined by the Structural Engineer of Record, as well as anticipated thermal expansion and elastic shortening of the building. Contractor's Engineer shall be responsible for all necessary project data and ensure that design complies with the Structural Engineer of Record live and dead load deflection criteria.

- F. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
- 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not fewer than 60 seconds.
- G. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
- H. Live Load Deflection: Design differential floor edge vertical movement between successive floors is $\pm 1/2$ -inch or as indicated on Structural Drawings.
- I. Seismic Performance: Structural-sealant-glazed curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and as indicated in Section 01 8316.
- 1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
- J. Thermal Performance: Match requirements specified for 08 4413 "Glazed Aluminum Curtain Walls".
- 1. Thermal Transmittance (U-factor):
 - 2. Solar Heat Gain Coefficient:
 - 3. Condensation Resistance:
- K. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:
- 1. Outdoor-Indoor Transmission Class: Minimum 30 .
- L. Sound Transmission Class (STC): Tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- 1. Sound Transmission Class: Minimum STC 32.
- M. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures.

Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
- N. Structural-Sealant Joints: Designed to produce tensile or shear stress of less than 20 psi (138 kPa).
- O. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURER

- A. Source Limitations: Obtain all components of Interior Aluminum-Framed Entrances and Storefront systems, including framing entrances and accessories, from single manufacturer, same as that specified in Section 08 4313 for Aluminum-Framed Entrances and Storefront systems.
- B. Basis-of-Design Product(s):
1. **Series 403-I (TS)**, Thermal Storefront Framing with high thermal performance by **EFCO**, www.efcocorp.com, 2 1/4-inch by 4 1/2 -inch profile and Center Set Glazing.
 2. **Series 406**, Thermal Storefront Framing with high thermal performance by **EFCO**, www.efcocorp.com, 2 -inch by 6 1/2 -inch profile and Front Set Glazing.
- C. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Arcadia, Inc.
 - a. **AG451T**, 2-inch by 4 1/2 -inch profile as equivalent to EFCO 403-I (TS), 2 1/4-inch by 4 1/2 -inch profile.
 - b. **TC670**, 2 1/4-inch by 6 -inch profile as equivalent to EFCO 406, 2 1/4-inch by 6 -inch profile.
 2. Wausau Window and Wall Systems, <http://www.wausauwindow.com>, 14000 Series and 14650 Series Thermal Units respectively.
 3. Substitutions: Section 01 2500.

2.3 STOREFRONT COMPONENTS

- A. Storefront Framing Systems: Provide storefront and entrance framing systems, fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members as required. Provide for flush glazing storefront from the exterior on all sides without projecting stops. Shop-fabricate and pre-assemble frame components where possible. Provide storefront frame sections without exposed seams.
1. Mullion Configuration: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Make provisions to drain moisture accumulation to the exterior.

2.4 GLAZING

- A. Glazing:
1. Insulated as specified in Division 08 Section "Glazing."
 2. Type refer to Drawings including, but not limited to A8.5
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
1. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
 2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
 - a. Color: As selected by Architect.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors:
1. Basis-of-Design Product: Match Entrances as specified in Section 08 4113 "Aluminum-Framed Entrances and Storefronts".
- B. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Refer to Section 08 4113 "Aluminum-Framed Entrances and Storefronts".
- C. Door Construction:
1. Refer to Section 08 4113 "Aluminum-Framed Entrances and Storefronts".
- D. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.6 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: **ASTM B 209** (**ASTM B 209M**).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B 221** (**ASTM B 221M**).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
- C. Fasteners: Aluminum or Series 300 nonmagnetic stainless steel.
 - 1. Do not use exposed fasteners except for application of hardware.
 - 2. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware item being fastened.
- D. Concealed Flashing: Dead-soft stainless steel or extruded aluminum as selected by manufacturer for compatibility with other components.
- E. Brackets and Reinforcements: Aluminum or nonmagnetic stainless steel.
 - 1. Provide non-staining, non-ferrous shims for installation and alignment as required.
- F. Weatherstripping: The weather seals shall be open cell urethane foam core bonded to a U.V. stabilized polyethylene liner. Provide weatherstripping on meeting stiles of pairs of doors and at bottom rail of each door leaf.

2.7 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
 - 1. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for **30-mil (0.762-mm)** thickness per coat.

2.8 FABRICATION

- A. General: Fabricate aluminum entrances and storefront components to designs, sizes and thickness indicated, and to comply with specified standards. Sizes and profile requirements are indicated on the drawings.

INTERIOR ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

- B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site. Disassemble components only where necessary for shipment and installation.
 - 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces.
 - a. Complete these operations for hardware prior to application of finishes.
 - 2. Do not drill and tap for surface-mounted hardware items until time of installation at Project site.
- C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.
 - 1. Welding behind finished surfaces shall be performed to minimize distortion and discoloration on the finished surface.
- D. Reinforcing: Install reinforcing as required for hardware, performance requirements, sag resistance and rigidity.
- E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, suitable sealant, elastomeric tape, or gasket between the surfaces.
 - 1. Do not use coatings containing lead.
- F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
 - 1. Fabricate curved members to true shapes as shown on drawings, segmented or faceted curves are not acceptable.
- G. Conceal fasteners wherever possible. Use stainless steel or Stalgard coated fasteners at all wet areas.
- H. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
- I. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- J. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

- K. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- L. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 DOOR, WINDOW AND FRAME FABRICATION

- A. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- B. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge unless specified otherwise in Door Hardware specifications.
 - 2. At doors, provide weather sweeps applied to door bottoms unless specified otherwise in Door Hardware specifications.
- C. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

2.10 ALUMINUM FINISHES

- A. High-Performance Organic Finish (Three-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Options as selected by Architect:
 - a. Match Finishes specified in Section 08 4113 "Aluminum-Framed Entrances and Storefronts".
 - b. Custom color for each window type as directed by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- D. Install glazing as specified in Section 08 8000 "Interior Glazing."
- E. Install perimeter joint sealants as specified in Section 07 9200 "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to **1/8 -inch** in **12 -feet** (**3 mm in 3.7 m**); **1/4 -inch** (**6 mm**) over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to **1/16 -inch** (**1.5 mm**).
 - b. Where surfaces meet at corners, limit offset from true alignment to **1/32 -inch** (**0.8 mm**).
- B. Diagonal Measurements: Limit difference between diagonal measurements to **1/8 -inch** (**3 mm**).

3.4 FIELD QUALITY CONTROL

- A. Repair or remove work if test results and observations indicate that it does not comply with specified requirements.

3.5 ADJUSTING

- A. Entrances : Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions, providing smooth operation without binding, and to prevent tight fit at contact points and weatherstripping.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 -inches (75 mm) from the latch measured to the leading door edge.

3.6 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance

- END OF SECTION -

- SECTION 08 4229 -**AUTOMATIC ENTRANCES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bi-parting Sliding Unit, with Fixed Sidelites

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 07 9200 "Joint Sealants".
- D. Section 07 9213 "Exterior Facade Joint Sealants".
- E. Section 08 4113 "Aluminum Framed Entrances and Storefronts".
- F. Section 08 7100 "Door Hardware".
- G. Section 08 8000 "Interior Glazing".
- H. Section 08 8013 "Exterior Glazing".
- I. Division 26 for electrical wiring.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.

- C. [American Architectural Manufacturers Association \(AAMA\)](#) Publications:
1. 2604 "Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels"
 2. 2605 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels"
- D. [American Society of Civil Engineers \(ASCE\)](#) Publications:
1. 7 "Minimum Design Loads for Buildings and Other Structures"
- E. [ASTM International \(ASTM\)](#) Publications:
1. B209 "Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate"
 2. B221 "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes"
 3. E283 "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen"
- F. [American National Standards Institute \(ANSI\)](#) / [Builders Hardware Manufacturers Association \(BHMA\)](#) Publications:
1. ANSI/BHMA A156.10, "Power Operated Pedestrian Doors"
 2. ANSI/BHMA A156.19 – "Power Assist and Low Energy Power Operated Doors"
- G. [American Welding Society \(AWS\)](#) Publications:
1. D1.2 "Structural Welding Code--Aluminum"
 2. A5.10 "Specification For Bare Aluminum And Aluminum-Alloy Welding Electrodes And Rods"
- H. [BHMA](#) A156.19 – American National Standard for Power Assist and Low Energy Power Operated Doors.
- I. [National Fire Protection Association \(NFPA\)](#) Publications:
1. 70 "National Electric Code"
- J. [The Society for Protective Coatings \(SSPC\)](#) Publications:
1. Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film)

1.5 DEFINITIONS

- A. Refer to [BHMA](#) A156.10 for definitions of terms.
- B. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Fixed Sidelight System: Exterior sliding active leaves swing out from any position in sliding mode.
- D. Full Breakout System: Interior sliding active leave and sidelites swing out from any position in sliding mode.
- E. Safety Device: Device that prevents a door from opening or closing.

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1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.
 - 1. Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic entrance doors.
 - 2. Product Certificates: Signed by manufacturers of automatic entrance doors certifying that products furnished comply with emergency exit door requirements.
 - 3. Maintenance Data: For door operators and control systems to include in maintenance manuals specified in Division 01. Include instructions on how to perform safety tests, and the name, address, and telephone number of nearest authorized service representative.
- F. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other Work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
 - 3. Design Calculations: Calculate requirements for seismic restraints.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the automatic entrance door manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Source Limitations: Obtain automatic entrance doors through one source from a single manufacturer.
- C. Welding Standards: Comply with [AWS](#) D1.2, "Structural Welding Code--Aluminum."
- D. Comply with [ANSI](#)/BHMA A156.10, "Power Operated Pedestrian Doors."

- E. Electrical Components, Devices and Accessories: Listed and labeled as defined in [NFPA 70](#), Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify automatic entrance door openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 COORDINATION

- A. Coordinate size and location of recesses in concrete floors for recessed sliding tracks. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 - "Cast-in-Place Concrete."
- B. Electrical System Rough-In: Coordinate layout and installation of automatic entrance door assemblies with connections to power supplies and security access control system.

1.11 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of the automatic entrance door system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Lateral deflection of glass lite edges in excess of 1/175 of their length or **3/4 -inch**, whichever is less.
 - 2. Excessive air leakage.
 - 3. Faulty operation of operators and hardware.
 - 4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: Two (2) years from date of Substantial Completion.

1.12 MAINTENANCE SERVICE

- A. Maintenance: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic entrance door Installer. Include bi-annual planned and preventive maintenance, repair or replacement of worn or defective components, lubrication,

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cleaning, and adjusting as required for proper entrance door operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. General: Provide automatic entrance door systems that have the following capabilities based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:
 1. Thermal Movements: Provide automatic entrance doors that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - a. Temperature Change (Range): 180 deg F, material surfaces.
 2. Operating Temperature Range: Provide automatic entrance door operators capable of operating between minus 20 deg F and plus 120 deg F.
 3. Structural Performance: Provide automatic entrance doors capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - a. Basic Wind Speed: As indicated in miles per hour (meters per second) at 33 feet (10 m) above grade. Determine wind loads and resulting design pressures applicable to Project according to the following, based on mean roof heights above grade as indicated on Drawings:
 - 1) Wind Loads: [ASCE 7](#), "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure."
 4. Air Infiltration:
 - a. Maximum air leakage through fixed glazing and framing areas of **1.25 cfm/sq. ft.** of door area when tested at an inward pressure differential of **1.57 lb/sq. ft.** according to [ASTM E283](#).
 - b. Maximum air leakage for full breakout glazing and framing areas of 1.3 cfm/sq. ft. of door area when tested at an inward pressure differential of **1.57 lb/sq. ft.** according to [ASTM E283](#).
 5. Opening Force:
 - a. Maximum opening force of 5 lbf in accordance with Americans with Disabilities Act (ADA) and "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
 - b. Not more than 50 lbf required to manually set door in motion of power fails, and not more than 15 lbf required to open door to minimum required width.
 - c. Entrapment Force Requirements: Not more than 30 lbf required to prevent stopped door from closing.

2.2 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. "Unislide OHC Series Bi-Parting "; Besam, An Assa Abloy Group Company (866-237-2687)
 - a. Exterior: "Unislide OC-S"
- B. Approved Manufacturers:
 - 1. "Dura-Glide, Series 2000, Bi-Parting"; Stanley Access Technologies, Division of The Stanley Works, <http://www.stanleyaccesstechnologies.com/index.asp?MODE=dg2000> (860-677-2861)
 - a. Exterior: "Model 7-2260"

2.3 AUTOMATIC SLIDING ENTRANCE SYSTEM

- A. System shall consist of sliding aluminum doors and sidelights, header, operator, cylinders, actuating controls, and directional motion sensors.
 - 1. Exterior: Model as shown above with half-beveled threshold.
- B. Automatic Sliding Door System: The system shall consist of sliding aluminum doors, sidelights, header, operator, and actuating controls. All components shall be factory assembled in the header, adjusted and tested.
- C. Sliding Aluminum Doors: Provide door units to dimension heights and widths with corresponding glazing as shown on Drawings with standard narrow stile. Door holders shall be provided for all panels to control the doors as they swing in the direction of egress. All door panels shall have security glass stops. All doors shall have intermediate rails. The bi-part sliding door system shall include a two-point lock securing the lead edges of the door stiles together and to the hanger assembly.
- D. Door Operation: Shall be bi-parting directional operation. In compliance with NFPA 101, the sliding door panels shall allow "breakout" to the full open position to provide instant egress at any point in the door's movement. To allow safe egress, automatic operation shall be discontinued when the sliding panel is in the "breakout" mode. Doors and sidelights shall be sized to prevent pinch points at meeting stiles.
 - 1. Emergency Breakaway Capability: Sliding leaves only
 - 2. Safety Search Circuitry: Shall be provided which will recycle the doors when an object is encountered during the closing cycle. The circuitry shall search for that object on the next closing cycle by reducing the door speed at the position the object was previously encountered, and will continue to close in check speed until the doors are fully closed, at which time the doors will reset to normal speed. If the obstruction is encountered again, the doors shall come to a full stop. The door shall remain stopped until the obstruction is removed and an operate signal is given, resetting the door to its normal speed.
 - 3. The doors shall be provided with a "Fail-Secure Electric Carriage Lock" in the header to prevent the doors from sliding in the night mode. This device shall not interfere with emergency breakout function.
- E. Doorway presence-sensing device:
 - 1. Model: "BEA Wizard Threshold" by Besam, "STAN-GUARD Threshold Sensor" by Stanley, or "Optional Sensor with added threshold scan", by Horton.

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- a. The sensor shall be factory-installed to the underside of the header.
 - b. The interior door sensing device shall be disabled (night mode) by a key switch furnished by others and installed by Division 08 7100.
- F. Interior Door to be activated during night-mode by remote card reader or push button override located at the front desk furnished by Others. Refer to Section 08 7100.
- G. Glazing:
 - 1. Refer to Section 08 8013 "Exterior Glazing".
 - a. Match adjacent storefront system unless indicated otherwise in drawings.
 - 1) Confirm with Architect.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extruded Bars, Rods, Profiles, and Tubes: [ASTM](#) B221.
 - 2. Sheet and Plate: [ASTM](#) B209.
 - 3. Welding Rods and Bare Electrodes: [AWS](#) A5.10.
- B. Refer to Section 08 8013 "Exterior Glazing".
 - 1. Match adjacent storefront system unless indicated otherwise in drawings.
 - a. Confirm with Architect.
- C. Sealants and Joint Fillers:
 - 1. Refer to Section 07 9213 "Exterior Façade Joint Sealants."
- D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with [SSPC](#)-Paint 12 requirements, except containing no asbestos; formulated for 30-mil thickness per coat.

2.5 COMPONENTS

- A. Framing Members: Manufacturer's standard extruded aluminum, minimum **0.125 -inch** thick and reinforced as required to support imposed loads.
- B. Stile and Rail Doors: Manufacturer's standard **1-3/4 -inch**-thick glazed doors with minimum **0.125-inch**-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
- C. Sidelites: Manufacturer's standard **1-3/4 -inch**-deep sidelites with minimum **0.125 -inch**-thick, extruded-aluminum tubular stile and rail members matching door design.
- D. Headers: Fabricated from minimum **0.125 -inch**-thick extruded aluminum and extending full width of automatic entrance door units to conceal door operators, carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
- E. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered ball-bearing-center steel

wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.

- F. Threshold: Manufacturer's standard threshold members and bottom-guide track system, with stainless-steel ball-bearing-center roller wheels.
- G. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- H. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
- I. Emergency Breakaway Sign: ANSI/BHMA A156.10; red background with 1-inch high contrasting letters with the words "IN EMERGENCY PUSH TO OPEN."

2.6 FABRICATION

- A. General: Fabricate automatic entrance door system components to designs, sizes, and thicknesses specified and to comply with indicated standards.
- B. Prefabrication: Provide automatic entrance doors as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
 - 1. Do not drill and tap for surface-mounted hardware items until time of installation at Project site.
 - 2. Perform fabrication operations, including cutting, fitting, forming, drilling, and grinding of metalwork in manner that prevents damage to exposed finish surfaces. For hardware, perform these operations before applying finishes.
 - 3. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
 - 4. Prepare components to receive concealed fasteners and anchor and connection devices.
 - 5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.

2.7 FINISHES

- A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604 and 2605.
 - 2. Color:
 - a. As shown on Exterior Finish Index.
 - b. Refer to Drawings.

AUTOMATIC ENTRANCES

PART 3 - EXECUTION

3.1 INSPECTION

- A. The automatic entrance door installer must examine the areas and conditions under which the automatic entrances are to be installed and notify the General Contractor in writing of conditions detrimental to the proper functioning of the entrance and the timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations. Set units plumb, level, and true. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- B. Sealants:
 - 1. Set framing members, thresholds, bottom-guide track system, and flashings in full sealant bed.
 - 2. Seal perimeter of framing members with sealant.

3.3 ADJUST AND CLEAN

- A. After repeated operation of completed installation, readjust door operators and controls for optimum operating condition and safety, comply with requirements in BHMA A156.10. Clean glass and aluminum surfaces promptly after installation. Advise General Contractor of protective treatment and other precautions required through the remainder of the construction period to ensure that automatic entrances will be without damage or deterioration (other than normal weathering) at the time of acceptance.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

- END OF SECTION -

- SECTION 08 4413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Provisions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following exterior assemblies:
 - 1. Glazed Aluminum Curtain Walls, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing.
 - 2. Curtain wall framing for punched openings, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Sections 01 4339 "Mockup Requirements".
- D. Section 01 4553 "Facade Mockup Testing".
- E. Section 01 8316 "Exterior Enclosure Performance Requirements".
- F. Section 07 9213 "Exterior Façade Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.
- G. Section 08 4113 "Aluminum Framed Entrances and Storefronts" for Storefront doors to be used in Curtain Wall System.
- H. Section 08 8013 "Exterior Glazing" for insulating-glass requirements.
- I. Section 08 9000 "Louvers and Vents" for units installed with aluminum-framed systems.

1.4 REFERENCED STANDARDS

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- C. General: In addition to requirements shown or specified, comply with:
 - 1. Applicable provisions of AAMA Metal Curtain Wall Manual for design, materials, fabrication and installation of component parts.

1.5 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.6 ACTION SUBMITTALS

- A. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated. Demonstrate compliance with specified criteria.
- C. VOC Submittals:
 - 1. VOC Limits, for adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, and bearing his seal and signature, detailing fabrication and assembly of glazed aluminum curtain-wall systems.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 - 4. Show project specific integrations to surrounding cladding and waterproofing components.
 - 5. Provide installation instructions and isometric details
 - 6. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.

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- f. How components will be installed and sealed watertight
- 7. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.
 - a. Resubmit Shop Drawings with changes made to glazed aluminum curtain walls to successfully complete preconstruction testing.
- E. Samples for Initial Selection: For units with factory-applied color finishes.
- F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- G. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- H. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
 - 2. Submit in accordance with requirements of Section 08 7100.

1.7 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.
- B. Professional Engineer Qualifications: Demonstrate compliance with specified requirements.
- C. Preconstruction Mockup Submittals:
 - 1. Preconstruction Testing Program: Developed specifically for Project.
 - 2. Preconstruction Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test, indicating compliance with performance requirements. For each system provide previous test reports with shop drawings.
 - 3. Photographs:
 - a. Take a minimum of 30 photographs at locations and intervals as required by Architect.
 - b. Submit digital color images on CD-R of mockup before, during, and after preconstruction testing.

- D. Seismic Qualification Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- E. Welding certificates.
- F. Qualification Data: For Installer and testing agency.
- G. Preconstruction Test Reports: For sealant.
- H. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazed aluminum curtain-wall systems.
- J. Source quality-control reports.
- K. Field quality-control test reports.
- L. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 7700.
- B. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- C. Warranty: Submit specified warranty.

1.9 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site after approval of complete submittals to comply with requirements in Division 1 Section "Project Management and Coordination". Review methods and procedures related to glazed aluminum curtain-wall systems including, but not limited to, the following:
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review required testing, inspecting, and certifying procedures.
 - 3. Review adjacent exterior cladding assemblies, air and vapor barriers, flashing and sealants specified in related sections for sequencing and coordination with glazed aluminum curtain-wall systems.

1.10 QUALITY ASSURANCE

- A. Provide glazed aluminum curtain walls that comply with test-performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing and tests performed on manufacturer's standard assemblies by a qualified testing agency.
- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of roof specialties that are similar to those indicated for this Project in material, design, and extent.
- D. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- E. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this section and who is acceptable to manufacturer.
 - 1. Installer shall have a minimum of five (5) years experience with projects of similar type and scope.
 - 2. Engineering Responsibility: Preparation of data and calculations for glazed aluminum curtain-wall systems, including the following:
 - a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project and submission of reports of tests performed on manufacturer's standard assemblies.
- F. Preconstruction Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and ICC-ES for preconstruction testing indicated.
- G. Product Options: Information on drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- H. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.
- I. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.
- J. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
- K. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.11 MOCKUPS

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. Refer to Section 01 4339 "Mockup Requirements".
1. Size and Configuration: As indicated on Drawings, if not shown on Drawings, provide as directed by Architect.
 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.12 PRECONSTRUCTION LABORATORY MOCKUPS

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform testing on preconstruction laboratory mockups. Refer to Section 01 4553 "Facade Mockup Testing".
- B. Build preconstruction laboratory mockups at testing agency facility; use personnel, products, and methods of construction that will be used at Project site.
1. Size and Configuration: As indicated on Drawings, if not shown on Drawings, provide as directed by Architect.
- C. Notify Architect seven days in advance of the dates and times when laboratory mockups will be constructed.
- D. Preconstruction Laboratory Mockup Testing Program: Test preconstruction laboratory according to requirements in "PERFORMANCE REQUIREMENTS" Article. Perform the following tests in the following order:
1. Structural: ASTM E 330 at 50 percent of positive test load.
 2. Air infiltration: ASTM E 283 at minimum test pressure of 6.24 psf.
 3. Water penetration under Static Pressure: ASTM E 331.
 4. Water Penetration under Dynamic Pressure: AAMA 501.1.
 5. Structural: ASTM E 330 at maximum 150 percent of positive and negative test loads. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 6. Interstory Drift: AAMA 501.4 at 100 percent of design displacement. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 7. Vertical Interstory Movement: AAMA 501.7. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 8. Thermal Cycling: According to AAMA 501.5. Repeat the following:
 - a. Air Infiltration: ASTM E 283.

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- b. Water Penetration under Static Pressure: ASTM E 331.
- 9. Structural: ASTM E 330 at 100 percent and 150 percent of positive and negative test loads. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
- E. Acoustical: Test assemblies for compliance with specified STC ratings as determined by testing according to ASTM E 90.

1.13 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.14 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain-wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain-wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions

1.15 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain-wall systems that do not comply with requirements or that deteriorate as defined in this section within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Adhesive or cohesive sealant failures.
 - d. Water penetration.
 - e. Failure of operating components to function normally.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace components showing evidence of deterioration of factory-applied within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by Contractor's qualified professional engineer, using performance requirements and design criteria indicated.
- C. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - c. Glass breakage.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units.
- D. Weather Resistance:
 - 1. Glazed aluminum curtain walls shall provide waterproofing and an air-vapor retarder that is continuous at all penetrations, transitions, and other conditions. Assemblies shall integrate with the building's waterproofing and air barrier / vapor-retarders to provide a weathertight transition.
 - 2. Air Movement: Assemblies shall not allow the movement of interior or exterior air to flow vertically within the assembly. Methods employed to prevent internal air movement shall not restrict water flow channels or prevent thermal movement of the frames.
 - 3. Water penetration into the assembly is acceptable only if all of the following conditions are satisfied; any other water penetration is considered water leakage and is unacceptable:
 - a. Water is immediately contained and drained to the exterior.
 - b. There is no wetting of a surface that could be damaged by moisture or that would be visible to building occupants.
 - c. There would be no staining or other damage to completed building or its furnishings.
 - d. This definition of water leakage governs over other definitions that may appear in referenced documents.
 - 4. Provide internal gutters and weep system to collect and drain water leakage and condensation to the exterior at the sill of each opening. Glazing assemblies shall have:
 - a. An isolated gutter cavity at each glass pane perimeter so that leakage is confined to and wept from the opening of leakage origin.

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- b. Continuous spliced gutters at mullion splices, with sealed end caps at termination conditions. Assemblies shall not direct water to contact edges of insulating glass units. Prevent water infiltration at weeps.
 - 5. Coordinate gutter and weep systems with exterior cladding assemblies specified in other sections, ensure drainage of accumulated water to exterior of building.
- E. Structural Loads:
 - 1. Wind Loads: As specified in Section 01 8316 "Exterior Enclosure Performance Requirements."
 - 2. Seismic Loads: As specified in Section 01 8316 "Exterior Enclosure Performance Requirements".
 - 3. Other Design Loads: As indicated on Drawings.
- F. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4-inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 -inch (3.2 mm), whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
 - 3. At safety loads of 150 percent of design load for metal members supporting glass, residual deflection of framing members shall not exceed 1/1000th of span.
 - 4. Accommodate a minimum 1/2 -inch live load deflection or greater, as determined by the Structural Engineer of Record, as well as anticipated thermal expansion and elastic shortening of the building .Contractor's Engineer shall be responsible for all necessary project data and ensure that design complies with the Structural Engineer of Record live and dead load deflection criteria.
- G. Live Load Deflection: Design shall accommodate differential floor edge vertical movement between successive floors as indicated in Section 01 8316 "Exterior Enclosure Performance Requirements".
- H. Structural: Test according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not less than 60 seconds.
- I. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - 1. Fixed Framing and Glass Area:
 - a. Air Infiltration: Provide glazed aluminum curtain-wall systems with maximum air leakage of 0.06-cfm/sq. ft. (0.30 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24-lbf/sq. ft. (300 Pa).

- J. Water Penetration Under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15.00 psf
 2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- K. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated in Section 01 8316 "Exterior Enclosure Performance Requirements", or as determined by Structural Engineer of Record.
 2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.
- L. Seismic Performance: Structural-sealant-glazed curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and as indicated in Section 01 8316.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
 2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.
- M. The IECC and ASHRAE/IES 90.1 require that all fenestration be certified and labeled by manufacturer for energy performance, based on ratings established by NFRC. Verify which manufacturers have tested structural-sealant-glazed curtain walls and can demonstrate compliance with NFRC. Verify requirements of authorities having jurisdiction.
- N. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.69 Btu/sq. ft. x h x deg F (3.92 W/sq. m x K) as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
- O. Energy Performance: Certify and label condensation energy performance according to AAMA as follows:
1. Condensation Resistance:
 - a. Condensation Resistance Factor (CRF): Fixed glazing and framing areas shall have an AAMA-certified condensation resistance rating of no less than 41 as determined according to AAMA 1503.
- P. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:
1. Outdoor-Indoor Transmission Class: Minimum 30 .
- Q. Sound Transmission: Test according to ASTM E 413 as follows:
1. Sound Transmission Class: Minimum STC 32.

- R. Thermal Movements: Allow for thermal movements resulting from maximum change (range) of ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
- S. Structural-Sealant Joints:
1. Designed to carry gravity loads of glazing.
 2. Designed to produce tensile or shear stress of less than 20 psi (138 kPa).
- T. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURER

- A. Basis of Design Product: **System 5500 2 1/4" x 7" Curtain Wall Thermal E-Strut™**, Two sided, Offset Structural Silicon Glazed (SSG) self supporting curtain wall system, Outside or Inside glazed with high thermal performance by **EFCO**, www.efcocorp.com.
1. Upper Level Floors 5 Through 19 if Wind Resistance of System is Still in Compliance With Required Performance Criteria: **System 5500 2 1/4" x 6" Curtain Wall Thermal E-Strut™**, Two sided, Offset Structural Silicon Glazed (SSG) self supporting curtain wall system, Outside or Inside glazed with high thermal performance by **EFCO**, www.efcocorp.com.
- B. Subject to compliance with performance, sizes and material requirements, provide the named products or comparable products by one of the following:
1. Wausau Window and Wall Systems, <http://www.wausauwindow.com>
 2. Arcadia, www.arcadiainc.com
 3. Substitutions: Section 01 2500.
- C. Source Limitations: Obtain all components of curtain wall system, including framing, metal spandrel panels and accessories, from single manufacturer.
1. Curtain wall manufacturer shall also provide storefront assemblies specified in related section.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken .
 - 2. Glazing System: Retained mechanically with gaskets on two sides and structural sealant on two sides.
 - a. In some locations where the designed horizontal spans exceed system capacity, provide vertical SSG so caps are not visible from exterior.
 - 1) Locations to be determined in shop drawings in coordination with the delegated design of the subcontractor/installer.
 - 3. Glazing Plane: Front .
 - 4. Finish: Color anodic finish .
 - 5. Fabrication Method: Factory-fabricated unitized system.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
 - 2. Specialty face caps as specified.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: **ASTM B 209** (**ASTM B 209M**).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B 221** (**ASTM B 221M**).
 - 3. Extruded Structural Pipe and Tubes: **ASTM B 429**.
 - 4. Structural Profiles: **ASTM B 308/B 308M**.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
 - 6. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: **ASTM A 36/A 36M**.
 - b. Cold-Rolled Sheet and Strip: **ASTM A 1008/A 1008M**.
 - c. Hot-Rolled Sheet and Strip: **ASTM A 1011/A 1011M**.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.

- C. Anchors: Three-way adjustable anchors with minimum adjustment of **1 -inch (25.4 mm)** that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- D. Fasteners: Aluminum or Series 300 nonmagnetic stainless steel.
 - 1. Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware item being fastened.
- E. Concealed Flashing: Dead-soft, **0.018-inch (0.457-mm-)** thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- F. Brackets and Reinforcements: Aluminum or nonmagnetic stainless steel. Provide non-staining, non-ferrous shims for installation and alignment as required.
- G. Weatherstripping: The weather seals shall be open cell urethane foam core bonded to a U.V. stabilized polyethylene liner. Provide weatherstripping on meeting stiles of pairs of doors and at bottom rail of each door leaf.

2.5 SPECIALTY FACE CAPS

- A. Application: Where indicated on drawings
- B. Manufacturer: Same as Curtain Wall manufacturer.
- C. Series: **2 1/2 -inch** Curtain Wall Pin-On Covers
- D. Name: **7 3/4 -inch** DEEP COVER (Deco Cap)
- E. Models:
 - 1. Typical: 13N1
 - 2. At Perimeter: 13N0
 - 3. At Intermediate: 13N7
- F. Finish: Match curtain wall aluminum
- G. Fabrication Method: Factory-fabricated

2.6 OPERABLE UNITS

- A. Doors: Comply with Section 08 4113 "Aluminum-Framed Entrances and Storefronts."

2.7 GLAZING

- A. Vision Glazing: As specified in Section 08 8013 "Exterior Glazing".
- B. Spandrel Glazing: As specified in Section 08 8013 "Exterior Glazing".

- C. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
 - 1. Compression-type design, replaceable, molded or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
- D. Glazing Sealants: For structural-sealant-glazed curtain walls, as recommended by manufacturer for joint type, compliant with VOC limits specified in Section 01 6116 and as follows:
 - 1. Structural Sealant: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.
 - a. Color: As selected by Architect from manufacturer's full range of colors
 - 2. Weatherseal Sealant (Where structural sealants are not also the weatherseal): ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.
 - a. Color: Match structural sealant.

2.8 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Exterior Façade Joint Sealants."
 - 1. VOC Limits, for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Framing Sealants: Manufacturer's standard sealants.
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.
- D. Cleaning Agent and Cloth: As recommended by structural-sealant manufacturer.
- E. Specialty Face caps as specified.

2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Sharp profiles, straight and free of defects or deformations.
 - 2. Components curved to indicated radii.
 - 3. Accurately fitted joints with ends coped or mitered.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.

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- 6. Provisions for reglazing from exterior Include accommodations for using temporary support device (dutchman) to retain glazing in place while sealant cures.
- 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible. All fasteners at intersection of horizontal and vertical members will be concealed.
- D. Fabricate components to resist water penetration as follows:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Factory-Assembled Frame Units:
 - 1. Rigidly secure nonmovement joints.
 - 2. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion.
 - 3. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - 4. Seal joints watertight unless otherwise indicated.
 - 5. Install glazing to comply with requirements in referenced related section.
- F. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

2.10 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: (Refer to Drawings for specific locations)
 - a. Dark bronze
 - b. Light Champagne
- E. Exposed surfaces shall be free of scratches and other serious blemishes.

2.11 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

2.12 INSULATED METAL SPANDREL PANELS

- A. Application: Where indicated on Drawings.
- B. Insulated Spandrel Panels: Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.
 - 1. Overall Panel Thickness: 1 -inch (25.4 mm) minimum and thicker as indicated.
 - 2. Exterior Skin: Aluminum.

- a. Thickness: Manufacturer's standard for finish and texture indicated.
 - b. Finish: Match framing system.
 - c. Texture: Smooth, unless otherwise indicated on Drawings.
 - d. Backing Sheet: 0.157-inch (4-mm-) thick, cement board, or 0.125-inch (3.2-mm-) thick, corrugated, high-density polyethylene as selected by manufacturer to meet indicated fire ratings.
 - 3. Interior Skin: Aluminum at exposed locations, Manufacturer's standard aluminum or galvanized-steel sheet at concealed locations.
 - a. Thickness: Manufacturer's standard for finish and texture indicated.
 - b. Finish: Matching curtain-wall framing at exposed locations, Low-gloss, white baked enamel or mill finish at concealed locations.
 - c. Texture: Smooth, unless otherwise indicated on Drawings.
 - d. Backing Sheet: 0.157-inch (4-mm-) thick, cement board, or 0.125-inch (3.2-mm-) thick, corrugated, high-density polyethylene as selected by manufacturer to meet indicated fire ratings.
 - 4. Thermal Insulation Core: Manufacturer's standard as selected by manufacturer to meet indicated fire ratings.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure non-movement joints.

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5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components plumb and true in alignment with established lines and grades.
- D. Install weatherseal sealant according to Section 07 9200 "Joint Sealants" and according to sealant manufacturer's written instructions, to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- E. Erection Tolerances: Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:
1. Plumb: 1/8-inch in 10-feet, 1/4-inch in 40-feet.
 2. Level: 1/8-inch in 20-feet; 1/4-inch in 40-feet.
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2-inch wide, limit offset from true alignment to 1/16-inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2- to 1-inch wide, limit offset from true alignment to 1/8-inch.
 - c. Where surfaces are separated by reveal or protruding element of 1-inch wide or greater, limit offset from true alignment to 1/4-inch.
 4. Location: Limit variation from plane to 1/8-inch in 12-feet; 1/2-inch over total length.
 5. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 -inch (3 mm).

3.4 OPERABLE UNITS

- A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation, weathertight enclosure and tight fit at weather stripping.
1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

- C. Test Area: Perform tests on representative areas of completed glazed, sealed and cured aluminum curtain walls selected by Architect or owner. Test one of each type of window including its integration with the exterior cladding, within each type of cladding system, per elevation or as directed by the Architect or Owner
 - 1. Conduct tests for air infiltration and water penetration with manufacturer's representative present.
- D. Field Quality-Control Testing: Perform the following tests:
 - 1. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
 - a. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
 - 2. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 9.00 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.
 - a. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
- E. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
 - 1. Test a minimum of four areas on each building facade.
 - 2. Repair installation areas damaged by testing.
- F. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements. Should failure occur, Contractor shall test one additional area for each failed location.
- I. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount. Additional testing and inspections will be performed, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
- J. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Operable Units: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions, providing smooth operation without binding, and to prevent tight fit at contact points and weatherstripping.
 - 1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 -inches (75 mm) from the latch measured to the leading door edge.

3.7 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that glazed aluminum curtain walls will be without damage or deterioration, other than normal weathering, at time of acceptance.

- END OF SECTION -

- SECTION 08 6300 -**METAL-FRAMED SKYLIGHTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes;
 - 1. Skylights with aluminum framing and glazing.
 - 2. Accessories for mounting and flashing to tie into roofing.

1.3 RELATED REQUIREMENTS:

- A. Section 06 1600 "Sheathing"
- B. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing"
- C. Section 07 7100 "Roof Specialties"
- D. Section 07 7200 "Roof Accessories: for prefabricated roof curbs."
- E. Section 07 6200 "Sheet Metal Flashing and Trim" for flashing that is not provided by Skylight manufacturer.
- F. Section 08 8013 "Exterior Glazing."
- G. Section 09 2216 "Non-Structural Metal Framing" for curb assembly.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal-framed skylights.
- B. Shop Drawings: For metal-framed skylights. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of assembly, showing the following:
 - a. Joinery including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.
 - a. Resubmit Shop Drawings with changes made to details of mockup to successfully complete preconstruction testing.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each framing intersection of assemblies, made from 12-inch (305-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- F. Delegated-Design Submittal: For metal-framed skylights indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer .
- B. Welding certificates.
- C. Preconstruction Test Reports: Prepared by a qualified preconstruction testing agency.

- D. Compatibility and Adhesion Test Reports: For structural-sealant-glazed skylights, test reports from sealant manufacturer indicating that joint sealants have been tested for each material that will come in contact with sealants.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for metal-framed skylights.
- F. Field quality-control reports.
- G. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of metal-framed skylights required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for skylights' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
- E. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing," for joint design and quality-control procedures.
 - 1. Joint designs are reviewed and approved by structural-sealant manufacturer.
 - 2. Quality-control program development and reporting comply with ASTM C 1401 recommendations for material qualification procedures, preconstruction sealant-testing program, and procedures and intervals for fabrication and installation reviews and checks.
 - 3. Perform manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants.
- F. Provide metal-framed skylights that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified independent testing agency.
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal-framed skylights as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site .

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-framed skylights that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage.
 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide the following:
 1. Basis of Design shall be **Pinnacle 300, Single Slope (SP)** glass glazed and aluminum framed skylight as manufactured by **Wasco Products, Inc.** www.wascoproducts.com or approved equivalent by one of the following;
 - a. Bristolite Skylights, P.O. Box 2515, 401 East Goetz Avenue, Santa Ana CA 92707, www.bristolite.com
 - b. O'Keeffe's Inc., 325 Newhall Street, San Francisco CA 94124-2693, www.okeeffes.com
 2. Assembly:
 - a. Components shall include manufacturer's complete assembly
 - b. Perimeter frames.
 - 1) Low side
 - 2) Sides and high side with;
 - a) Aluminum Retainer
 - b) Snap Lock Closure

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- c) Stainless steel fasteners
- c. Intermediate Rafters with Snap-on closure
- d. Purlins:
 - 1) As required by skylight manufacturer based on skylight size
- e. Perimeter aluminum Apron
- f. Stainless steel anchors for installers attachment to curb.
- g. All glazing installation components including;
 - 1) Gaskets
 - 2) Butyl tape
 - 3) Sealants

2.2 PERFORMANCE REQUIREMENTS

- A. General: Metal-framed skylights shall withstand the effects of the following without failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Movements of supporting structure.
 - 4. Dimensional tolerances of support system and other adjacent construction.
 - 5. Failure includes, but is not limited to, the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Glazing-to-glazing contact.
 - e. Noise or vibration created by wind and by thermal and structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
- B. Delegated Design: Design metal-framed skylights, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Seismic Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Glazing Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ -inch (19.1 mm), whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to $L/360$ of clear span or $1/8$ -inch (3.2 mm), whichever is smaller.

- E. Lateral Bracing of Framing Members: Compression flanges of flexural members are laterally braced by cross members with minimum depth equal to 50 percent of flexural member that is braced. Glazing does not provide lateral support.
- F. Structural-Test Performance: Provide metal-framed skylights tested according to ASTM E 330, as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not less than 30 seconds.
- G. Air Infiltration: Provide metal-framed skylights with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
- H. Water Penetration under Static Pressure: Provide metal-framed skylights that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- I. Water Penetration under Dynamic Pressure: Provide metal-framed skylights that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
 - 1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- J. Thermal Movements: Provide metal-framed skylights that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- K. Condensation Resistance: Provide metal-framed skylights with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
- L. Structural Sealant: Capable of withstanding tensile and shear stresses imposed without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
- M. Energy Performance: Provide metal-framed skylights with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:

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1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than as indicated in Exterior Glazing specification as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than as indicated in Exterior Glazing specification as determined according to NFRC 200.

N. Glazing shall meet requirements of AAMA

2.3 SKYLIGHT FRAMING SYSTEMS

- A. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 3. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 4. Structural Profiles: ASTM B 308/B 308M.
 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 1. Include snap-on aluminum trim that conceals fasteners.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.
- D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 1. At pressure caps, use ASTM A 193/A 193M stainless-steel screws.
 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 3. Reinforce members as required to receive fastener threads.
 4. Use exposed fasteners with countersunk Phillips screw heads, fabricated from Series 300 stainless steel.
- E. Anchor Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), galvanized steel.
- F. Concealed Flashing: Dead-soft, 0.018 -inch (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended in writing by manufacturer.
- G. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.040 -inch (1.016 mm) thick.
- H. Framing Gaskets: Manufacturer's standard.
- I. Apron flashing: Manufacturer's standard.
- J. Sealant: Manufacturer's standard.

- K. Framing Sealants:
 - 1. As specified in Section 07 9213 "Exterior Façade Joint Sealants." When not part of skylight manufacturers assembly.
- L. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 GLAZING

- A. Glazing:
 - 1. Assembly:
 - a. 1 1/8 -inch thick insulated assembly including;
 - 1) 1/4 -inch exterior tempered lite
 - 2) 1/2 -inch sealed air space
 - 3) 3/8 -inch interior laminated safety glazing
 - 2. Glass type and performance as specified in Section 08 8013 "Exterior Glazing."
 - a. See glass type **IG2**
- B. Spacers, Setting Blocks, and Gaskets: Manufacturer's standard elastomeric types.
- C. Bond-Breaker Tape: Manufacturer's standard tetrafluoroethylene-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- D. Glazing Sealants: As specified in Section 08 8013 "Exterior Glazing."

2.5 FABRICATION

- A. Where practical, fit and assemble metal-framed skylights in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Fabricate aluminum components before finishing.
- C. Fabricate aluminum components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within skylight to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
- D. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
- E. Reinforce aluminum components as required to receive fastener threads.

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- F. Weld aluminum components in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- G. Factory-Glazed, Metal-Framed Skylights:
 - 1. Factory install glazing.
 - 2. Glazing material to comply with requirements in Section 08 8013 "Exterior Glazing."
 - 3. Prepare surfaces that will contact structural sealant according to structural-sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Four-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: Match Architect's sample.

2.7 SOURCE QUALITY CONTROL

- A. Structural-Sealant Glazing: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, material qualification procedures, sealant testing, and fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine and approve curb assembly prior to installation.
- C. Coordinate with roofing material installed by others.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.

3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 4. Rigidly secure non-movement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 7. Seal joints watertight unless otherwise indicated.
- B. Metal Protection: Where aluminum will contact dissimilar materials, protect against galvanic action by painting contact surfaces with protective coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within skylight to exterior.
- E. Install components plumb and true in alignment with established lines and elevations.
- F. Install glazing as specified in Section 08 8013 "Exterior Glazing."
- G. Erection Tolerances: Install metal-framed skylights to comply with the following maximum tolerances:
1. Alignment: Limit offset from true alignment to **1/32 -inch (0.8 mm)** where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than **3 -inches (76 mm)**; otherwise, limit offset to **1/8 -inch (3.2 mm)**.
 2. Location and Plane: Limit variation from true location and plane to **1/8 -inch in 12 -feet (3.2 mm in 3.7 m)** but no greater than **1/2 -inch (13 mm)** over total length.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
1. Water-Spray Test: Before installation of interior finishes has begun, skylights shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 2. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.
 - a. Test Procedures: Test under uniform and cyclic static-air pressure.
 - b. Static-Air-Pressure Difference: 0.67 times the pressure specified for laboratory testing according to ASTM E 331.
 - c. Water Penetration: None.
 3. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.
 - a. Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C 1401, Appendix X2, shall be used.
 - 1) A minimum of two area(s) on each skylight face shall be tested.
 - 2) Repair installation areas damaged by testing.

METAL-FRAMED SKYLIGHTS

4. Structural-Sealant Glazing Inspection: After installation of metal-framed skylights is complete, structural-sealant glazing shall be inspected and evaluated according to ASTM C 1401 recommendations for quality-control procedures.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

- END OF SECTION -

- SECTION 08 7100 -**DOOR HARDWARE**

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. BHMA finish door hardware for hollow metal, wood and aluminum doors.
- B. Accessories including but not limited to door stops, kickplates, and push/pull plates.
- C. Weatherstripping, seals, and thresholds.
- D. Additional stock hardware: Provide devices as specified in 08 7100 part 2 below. Provide a list of these additional devices including, but not limited to quantity of keys in submittals for review.

1.2 RELATED SECTIONS

- A. Summary of work: Division 1, applicable sections.
- B. Swinging Gates: Metal Fabrications, applicable sections including but not limited to ornamental, wood and/or chain link gates.
- C. Masonry: Division 4, applicable sections.
- D. Carpentry: Division 6, applicable sections (061000 Rough Carpentry).
- E. Division 8, applicable sections including but not limited to: Wood Doors; Hollow Metal Doors and/or Frames; Storefront; Aluminum Doors and/or Aluminum Frames; Sliding Glass or Framed Doors; All-Glass Doors; Nana-type doors.
- F. Perimeter Sealants; Insulation: Division 7, applicable sections.
- G. Section 26 and 28 - Electrical rough in, wiring & connectors for electrified hardware and card readers.
- H. Division 6 - Carpentry and applicable sections (including Rough Carpentry).
- I. Division 9 - Finishes including applicable sections: including Non-Structural Metal Framing, Gypsum Board and Painting.
- J. Divisions 26 and 28 - Electrical rough in, wiring & connectors for electrified hardware and card readers.

1.3 RELATED DOCUMENTS AND COORDINATION

- A. The hardware groups/sets specified in section 087100 - PART 3 are intended to establish type and design standard when used together with the requirements of this Section, Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections. Examine Contract Documents and furnish proper hardware for door openings. Refer to specifications for clarification and detailed requirements and provide products and services in specifications even if not written in hardware groups/sets in section 087100 - PART 3.

1.4 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
1. Refer to Architect's Division 01 (see above for related sections) for definitions, acronyms, and abbreviations.
- B. Unless otherwise noted; standards, manuals, and codes refer to the latest edition as of the issue date of this Project Manual.
- C. Conform to the following Referenced Standards and Regulatory Requirements:
1. CBC – 2010 California Building Code.
 2. NFPA 80 – Standard for Fire Doors and other Opening Protectives.
 3. S-FM Standard 12-7-4 – Fire Door Assembly Tests.
 4. ANSI A156 Series – Builders Hardware Manufacturers Association (BHMA) Standards Set.
 5. UL Building Materials Directory.
 6. UL 305 – Standards for Panic Hardware.
 7. ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.

1.5 COORDINATION

- A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware. In particular, coordinate door preparation in accordance with applicable regulatory and trade standards specified.
1. Provide hardware templates to door and frame manufacturer. Provide 2 templates to those manufacturers who are not currently registered template book holders.
 2. Provide finish hardware schedule for use by the door and frame suppliers.
 3. Where hardware sets/groups have different information than the specifications refer to the specifications and drawings for clarification and bid combined hardware sets/groups and Contract Documents/specifications (provide combined materials/devices at time of submittals). In addition to other coordination items:
 - a. Coordinate floor closers (Rixson or Dorma as specified) to have cement case either Rixson #253000-PKG type cement case or as required for each floor closer location. Cement case to be delivered and installed in floor slabs before cement is poured. Additional floor closers device materials to be delivered and installed with remainder of finish door hardware.
 - b. Coordinate keying requirements as specified in this Section.

- B. Convene coordination meeting between all opening vendors & installers at least two weeks prior to purchasing doors, frames, door hardware and electrical devices required for complete systems.
1. Required attendance includes but is not limited to the following: Contractor; hardware supplier and/or installer; door supplier and/or installer; frame supplier and/or installer; auto operator vendor and/or installer; security card reader vendor and/or installer; and electrical.
 2. Contractor shall be responsible for verifying that the door hardware accepted for installation is compatible for use with the doors and door-frames.
 3. For card reader interface with applicable door devices, security vendor and/or installer (coordinate accordingly) to have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational card access system. The card reader interface scope includes but is not limited to card reader inputs & output coordination on the electric locking device power supply, electric locking devices and connectivity as well as confirmation of a complete, wired and operational card access system. Provide all required relays & devices as part of the overall system in accordance system requirements at no additional cost to Owner.
 4. For auto operator interface with applicable door devices, auto operator vendor and/or installer (coordinate accordingly) to have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational auto operator system. The auto operator interface scope includes but is not limited to connectivity & inputs for push-plates, BEA BR3 (or approved equal required auto operator relays), electric locking devices, as well as confirmation of the complete, wired and operational auto operator system. Provide all required relays & devices as part of the overall system in accordance system requirements at no additional cost to Owner.
 5. Vendor and/or installer (coordinate accordingly) not responsible for electrical-power (see electrical drawings) or FLS (fire/life safety) connectivity to above frame or back-of-house power supply (back-of-house meaning remote low voltage power). FLS connectivity only required for fire or smoke rated opening in particular functions to meet code as scheduled.

1.6 SUBMITTALS

- A. General:
1. Submit in accordance to Division 01 (see above for related sections).
- B. Pre-Hardware Schedule:
1. Report all prevailing conditions that will adversely affect satisfactory execution of work. Examine existing doors and/or frames scheduled for hardware replacement. Provide hardware necessary for completion of the work to conform with the intent of this Section as to quality, function, code compliance, and as scheduled at no additional cost to the Owner. Do not proceed with work until unsatisfactory conditions have been corrected. Starting work constitutes acceptance of existing conditions and this Contractor shall then, at his expense, be responsible for correcting all unsatisfactory and defective work encountered. Field-verify location of existing hinge reinforcing and strike plate on door frame.

- C. Submit a detailed door and hardware schedule according to the following:
1. Hardware Schedule:
 - a. Submit 5 copies of hardware schedule in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Schedules which do not comply will be returned for correction before checking. Horizontal-type schedules will be returned for correction before checking.
 - b. Hardware schedule shall clearly indicate architect's hardware group and manufacturer of each item proposed.
 2. Provide 2 copies of illustrations from manufacturer's catalogs and data in brochure form.
 3. Wiring Information: Provide manufacturers' wiring information including manufacturers' door elevation diagrams for electrified hardware based on Door Hardware Institute (DHI) core class "Electrified Architectural Hardware" (DHI class #COR133. Openings where only magnetic hold-opens or door position switches are specified do not required wiring information. Provide information with hardware schedule submittal for approval. Provide detailed wiring diagrams with hardware delivery to jobsite.
 4. Architect review of schedules does not relieve the Contractor of providing all hardware required for the Work, whether or not such hardware was inadvertently omitted from Submittal. No extra cost will be allowed for changes or corrections necessary to facilitate the proper installation of hardware.
- D. Templates:
1. Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.
 2. Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
- E. Installation Instructions:
1. Provide manufacturer's written installation and adjustment instructions for finish hardware.
 2. Send installation instructions to site with hardware.
- F. Single Manufacturers for Manufacturer's devices.
1. Obtain each type of hardware from single manufacturer, although several may be indicated as offering products complying with requirements.
- G. Contract Closeout Submittals: include specific requirements indicated below.
1. Operating and maintenance manuals: Submit 3 sets containing the following:
 2. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
 3. Catalog pages for each product.
 4. Name, address, and phone number of local representative for each manufacturer.
 5. Parts list for each product.
 6. Copy of final approved hardware schedule, edited to reflect "As installed".
 7. Copy of final keying schedule.
 8. As installed "Wiring Diagrams" for each opening connected to power, both low voltage and 110 volts.

1.7 QUALITY ASSURANCE:**A. Supplier Qualifications & Documentation:**

1. Hardware Supplier Qualifications: Firm specializing in the supply and servicing of institutional and commercial door hardware; accredited by manufacturers; and having a minimum of 3 years documented experience. Hardware supplier to furnish list of at least 10 projects (past, finished projects). Include date competed, project location and references (past project contact information). At least one member of the firm's staff shall be a member of DHI in good standing and is a DHI certified consultant having earned the title Architectural Hardware Consultant (AHC).

B. Manufacturer of submitted devices - Qualifications & Documentation:

1. Manufacturer Qualifications: Manufacturer specializing in manufacturing institutional and commercial door hardware with a minimum 5 years with the following documented experience. Furnish list of at least 10 projects (past, finished projects). Include date competed, project location and references (past project contact information to determine if Builders Hardware is acceptable).

C. Installer of submitted devices - Qualifications & Documentation:

1. Installer qualifications: The installer of assembly shall be trained in the trade of hanging commercial doors on commercial frames with commercial hardware. Supplier & Installer of door assemblies shall be authorized representative of manufacturers and have minimum of 5 years successful experience in detailing, supplying and installing Integrated Door Assemblies specified on projects of similar size, complexity and type to this Project.

D. Pre-Installation Meetings.

1. Conduct pre-installation meeting in accordance with Architect's Division 01 (see above for related sections).
2. Convene pre-installation meeting one week prior to commencing work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Architect's to Division 01 (see above for related sections)
- B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- C. Storage: Store materials in a cool and dry location, elevated from the ground and protected from the elements, and secured from theft or pilferage.

1.9 WARRANTY

- A. Comply with provisions of Division 01.
- B. Warranty installed units to be free from defects in material and workmanship as follows:
 1. Hinges: Lifetime Warranty (Life of Building).
 2. ANSI Grade 1 Locksets and Exit Devices: Three years.
 3. ANSI Grade 1 Closers: Ten years.
 4. All other ANSI Grade 1 hardware: Two years.

1.10 MAINTENANCE

- A. Provide special wrenches and tools applicable to each special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware manufacturer.

PART 2 - PRODUCTS

2.1 RECYCLED CONTENT:

- A. Provide products with at least the following content:
 - 1. Mortise Locks: 52% post-consumer recycled content
 - 2. Closers: 50% post-consumer recycled content
 - 3. Exit Devices: 50% post-consumer recycled content
 - 4. Steel Hinges: 35% pre-consumer recycled content
 - 5. Steel Kick Plates: 35% pre-consumer recycled content

2.2 HARDWARE TEMPLATE

- A. Make templates for hardware to be applied to metal or to pre-finished doors.
- B. Hinge templates shall conform to ANSI A156.7.
- C. Promptly furnish template information or templates to door and frame manufacturers.
- D. Coordinate hardware items to prevent interference with each other.

2.3 FIRE RATED DOORS AND EXIT DOORS

- A. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device (provide all specifications even if not written in hardware sets/groups):
- B. Provide all hardware necessary to meet the requirements of CBC for fire doors and exit doors, as well as to other requirements specified, even if such hardware is not specifically mentioned under Article "Hardware Schedule" of this Section.

2.4 FINISH

- A. Unless otherwise specified, finishes shall be as follows:
 - 1. BHMA 626 – satin chromium plated brass or bronze.
 - 2. BHMA 628 – satin or dull aluminum, clear anodized (uncoated).
 - 3. BHMA 630 – satin stainless steel.
 - 4. BHMA 652 – satin or dull chromium plated steel.
 - 5. BHMA 689 – sprayed aluminum paint finish.

2.5 SCREWS, BOLTS, AND FASTENING DEVICES

- A. Exposed head oval phillips type screws in countersunk holes unless otherwise specified. Use screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate length, type, head, metal and finish as necessary for proper match and application of hardware.
- B. Threshold anchors shall be Flat Sleeve Anchors (FHSL 25 1/4 - 20 2 inch) cadmium plated expansion anchor screw in one unit.

2.6 SUBSTITUTIONS

- A. Unless otherwise noted, manufacturers and products are listed in this Section to establish minimum requirements as to quality and performance (including ANSI standards and manufacturers features that will be required during the submittal stage).
 - 1. Otherwise refer to Architect's Division 01 for substitutions.

2.7 COMBINE SPECIFICATIONS & HARDWARE GROUPS/SETS IN 087100 PART 3

- A. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device (provide all products and services in specifications even if not written in hardware groups/sets in PART 3):

2.8 STOCK

- A. Provide additional stock hardware devices:
 - 1. In addition to the supplied locking/latching devices in specification 087100, Part Three (3) hardware sets/groups, provide the following devices in the submitted lock manufacturer brands (40 additional locks or latchsets total):
 - a. Provide 10 each - Hotel Battery Powered Locksets: same RFID series x Auto Deadbolt x Interior ADA Thumbturn x US Ship Handle Lever x prep for Schlage IC keyed core x BHMA 626 finish as submitted for entry rooms door locksets.
 - b. Provide 10 each - Hotel Battery Powered Locksets: same RFID series x US Ship Handle Lever x prep for IC, keyed core x BHMA 626 finish as submitted for non-entry room RFID series door locksets.
 - c. 5 each - Storeroom-Type Lockset ND80TD x SPA lever design x BHMA 626 finish.
 - d. 5 each - Classroom-Type Lockset ND70TD x SPA lever design x BHMA 626 finish.
 - e. 10 each - Privacy-Type Latchset: S40D x NEP lever design x BHMA 626 finish.

2.9 HANGING HARDWARE

- A. Gate Hanging Devices
 - 1. Heavy duty offset hinge, flat mount hinges:
 - a. Where nomenclature or device # "Gorilla-Device, Offset Hinges" are specified in hardware group/sets, provide Gorilla-Device, Offset Hinges by Guardian Gate manufacturing (Tucson, AZ; 800-213-9525), or equal.

- b. Provide at least three offset hinges per gate leaf.
 - 1) Provide two #Gorilla-Device offset hinges for doors up to 60 inches high and one additional #Gorilla-Device offset hinge for each 30 inches of height or fraction thereof.
 - 2) Furnish three #Gorilla-Device offset hinges for doors over 36 inches wide no matter the gate height.
 - 3) Provide additional number of offset hinge devices to meet offset hinge manufacturer device warranty as well as gate warranty.
 - c. Provide widths sufficient to clear trim projection when door swings 180°. Confirm hinge sizing with frame details. All doors shall swing 180 degrees if opening will allow. Provide wide throw hinges where required.
 - d. Provide non-removable pins at exterior doors and where required by Owner for security reasons.
 - e. Gorilla-Device offset gate hinges shall be mounted with the yoke welded to the gate and the channel welded to the post. The hinges shall be installed with the hinge pins in a straight line. Weld only on the vertical portions of the yoke and plate. Do not weld the top and bottom of the hinges.
 - 1) Provide devices ground smooth and painted to match gate/fence system – see Division 09 for paint and primer requirements.
 - 2) For all other manufacturers: gate hinges are to be mounted and welded in accordance with manufacturer's recommendations.
 - 3) Coordinate with other welding requirements in Contact Documents.
 - f. Products by the following manufacturers will be considered for approval providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents and intended operation.
 - 1) Crown Industrial <http://www.crown-industrial.com/>
 - 2) Ameristar.
 - 3) Monumental Iron Works.
2. Heavy duty full surface mounted hinge:
- a. Where nomenclature or device #“CBW-HD Series” hinge-type devices are specified in hardware group/sets, provide CBW-HD Series, full surface hinges by Crown Industrial (So. San Francisco, CA; (650) 952-5150; <http://www.crown-industrial.com/>, or equal.
 - b. Provide at least two hinges per gate leaf.
 - 1) Provide two # CBW-HD Series hinges for doors up to 72 inches high and one additional # CBW-HD Series hinge for each 30 inches of height or fraction thereof.
 - 2) Furnish three # CBW-HD Series hinges for doors over 36 inches wide no matter the gate height.
 - 3) Provide additional number of offset hinge devices to meet hinge manufacturer device warranty as well as gate warranty.
 - c. Provide widths sufficient to clear trim projection when door swings 180°. Confirm hinge sizing with frame details. All doors shall swing 180 degrees if opening will allow. Provide wide throw hinges where required.
 - d. Provide non-removable pins at exterior doors and where required by Owner for security reasons.

- e. Gate hinges are to be mounted and welded in accordance with manufacturer's recommendations.
 - 1) Coordinate with other welding requirements in Contact Documents.
 - 2) Provide devices ground smooth and painted to match gate/fence system – see Division 09 for paint and primer requirements.
 - f. Products by the following manufacturers will be considered for approval providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents and intended operation.
 - 1) Guardian Gate www.guardiangatehardware.com
 - 2) Ameristar.
 - 3) Monumental Iron Works.
 - 3. Gates specified with standard butt-type hinges, pivots and/or floor closers:
 - a. See butt-type hinges, pivots and floor closers specification requirements below.
- B. Butt Hinges & Pocket -Pivot Hinge
- 1. Butt Hinges to be manufactured in accordance with ANSI/BHMA A156.1.
 - 2. Acceptable Manufacturers:
 - a. Ives Manufacturing/
 - b. Hager Manufacturing.
 - c. McKinney Products Co.
 - d. Stanley Works.
 - e. Bommer Manufacturing.
 - 3. Where hardware groups/sets have different information (number of standard or pocket pivot hinges & sizing) refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device
 - a. Provide "weight/strength" as specified in hardware groups/sets in part 3 (hinge nomenclature basis of design weight/strength).
 - b. For doors 1-3/4" thick and up to 36" wide, provide hinge height: 4-1/2".
 - c. For doors 1-3/4" thick and 37" to 48" wide, provide hinge height: 5"
 - d. If hardware sets specify height (example 5" tall at 36" door), provide height as specified for project standards at these locations.
 - e. Provide two butts for doors up to 60 inches high and one additional butt for each 30 inches of height or fraction thereof. Furnish three butts for doors up to 36 inches wide. Furnish four butts for doors over 36 inches wide.
 - f. Provide widths sufficient to clear trim projection when door swings 180°. Confirm hinge sizing with frame details. All doors shall swing 180 degrees if opening will allow. Provide wide throw hinges where required.
 - g. Provide non-removable pins at exterior doors and where required by Owner for security reasons.
 - h. Provide ball-bearing hinges for all doors with closers.

- i. Electric Hinges: Provide electrified hinges with certified UL Listed, concealed wires. Provide electric hinges with standardized wire colors to accommodate up to 12 wires (4, 6, 8 or 12 as required per to provide sufficient number of concealed wires to accommodate electric function of specified hardware). If additional wires are specified (more than needed for electrified devices), provide the wires specified.
- C. Continuous Hinges
- 1. Stainless Steel Continuous Hinges Cycle Testing to be in accordance with ANSI/BHMA Standard A 156.26 Grade 1
 - 2. Stainless Steel Continuous Hinge Acceptable Manufacturers:
 - a. Markar Manufacturing.
 - b. McKinney Products Co.
 - c. Hager Manufacturing.
 - d. Select Hinges.
 - e. Bommer Manufacturing.
 - 3. Aluminum Continuous Hinge Acceptable Manufacturers:
 - a. Pemko Manufacturing.
 - b. Bommer Manufacturing.
 - c. Select Hinges.
 - d. McKinney Products Co.
 - e. Stanley Works.
 - f. Ives Manufacturing by Ingersoll Rand.
 - g. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - 1) Provide widths sufficient to clear trim projection when door swings 180°. Confirm hinge sizing with frame details. All doors shall swing 180 degrees if opening will allow. Provide wide throw hinges where required.
 - 2) Material: Extruded tempered aluminum. Material Standard: 6063-T6 alloy. Configuration: Three interlocking extrusions in pinless assembly, installed to full height of door frame. Electrical Modifications: SUR specified electrical modifications are no substitution. Testing Standard: Tested according to ANSI/BHMA A156.26.
 - 3) Electric Hinges: Provide electrified hinges with certified UL Listed, concealed wires. Provide electric hinges with standardized wire colors to accommodate up to 12 wires (4, 6, 8 or 12 as required per to provide sufficient number of concealed wires to accommodate electric function of specified hardware).
 - 4) Provide custom paint, powered coated flat black finish where indicated in hardware group/sets. Custom painting to be done offsite by certified paint vendor and shipped to project site complete (no site painting allowed for powder coat process to meet warranty).

D. Floor Closers and Intermediate Pivots

1. Acceptable Manufacturers:
 - a. Dorma Manufacturing.
 - b. Rixson Manufacturing.
 - c. Dor-O-Matic Manufacturing.
 - d. Ives Manufacturing.
2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Floor closers shall be complete with ball-bearing top pivot, floor plates, intermediate pivots and cement boxes unless indicated otherwise.
 - b. Provide one intermediate pivot for doors less than 91 inches high. Two intermediate pivots for doors between 91 inches and 121 inches high. Intermediate pivots spaced equally not less than 25 inches or not more than 35 inches on center, for doors over 121 inches high.
 - c. Provide floor closers with adjustable swing speed, latch speed, back-check, and automatic hold-open features. Closer shall have built in positive stop at specified degree of opening.
 - d. Floor closers shall meet maximum opening force requirements of ADA.
 - e. Provide the following items for installation and Owner use:
 - 1) 2604 Pivot Locator (basis of design: provide submitted pivot or floor closer manufacturers pivot locator).
 - 2) 185 Quickspotter (basis of design: provide submitted pivot or floor closer manufacturers pivot locator).
 - f. Electric Intermediate Pivots and Floor Closer Devices: Provide electrified devices with certified UL Listed, concealed wires. Provide electric hinges with standardized wire colors and concealed plug connectors to accommodate up to 12 wires (4, 6, 8 or 12 as required per to provide sufficient number of concealed wires to accommodate electric function of specified hardware).

E. Floor Pivots and Intermediate Pivots

1. Acceptable Manufacturers:
 - a. Rixson Manufacturing.
 - b. Dor-O-Matic Manufacturing.
 - c. Dorma Manufacturing.
 - d. Ives Manufacturing.
2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Pivot sets shall be complete with oil-impregnated top pivot, unless indicated otherwise. For offset pivoted doors, provide one intermediate pivot for doors less than 91 inches high. Two intermediate pivots for doors between 91 inches and 121 inches high. Intermediate pivots spaced equally not less than 25 inches or not more than 35 inches on center, for doors over 121 inches high.

- b. Provide the following items for installation and Owner use:
 - 1) 2604 Pivot Locator (basis of design: provide submitted pivot or floor closer manufacturers pivot locator).
 - 2) 185 Quickspotter (basis of design: provide submitted pivot or floor closer manufacturers pivot locator).
 - c. Electric Intermediate Pivots: Provide electrified devices with certified UL Listed, concealed wires. Provide electric hinges with standardized wire colors and concealed plug connectors to accommodate up to 12 wires (4, 6, 8 or 12 as required per to provide sufficient number of concealed wires to accommodate electric function of specified hardware).
- F. Invisible/Concealed Hinges
- 1. Approved Manufacturer:
 - a. Simonswerk (Tectus 3-D adjustable type hinges)
 - b. Project standard, no substitutions permitted.
 - 2. Where hardware groups/sets have different information (number of hinges and sizing) refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Contractor to install two of the three specified TE 640 3D A8 (or TE 640 3D if size of opening dictates the lack of A8 nomenclature) concealed hinges near the top of the door as recommended by Simonswerk/Bridgeport Worldwide.
 - b. Contractor to verify all recommended hinge sizes as well as hinge installation placement with Simonswerk (Bridgeport Worldwide is US Distributor): Matthew Preston, 285 Knowlton Street, Bridgeport, CT 06608; mpreston@bridgeportworldwide.com; 1-800-362-1484 extension 22
- G. Hardware - Pocket Doors, Barn Doors, Bi-Folding & Sliding Door
- 1. Acceptable Manufacturers:
 - a. Mandy Li Collection
 - 1) 617 South Raymond Avenue
 - 2) Alhambra, CA 91803-1534
 - 3) <http://www.mandylicollection.com/>
 - b. If all specifications can be met and Interior Designer deems approved, the following manufacturers will be considered (submit substitution per Division 01).
 - 1) K. N. Crowder (as specified)
 - 2) Hafele Manufacturing
 - 2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Coordinate with related door details and drawings.
 - b. Where either no hardware is specified for Pocket Doors, Barn Doors, Bi-Folding & Sliding Door or the specified hardware does not meet all requirements for complete units: submit BHMA A156.14 type system; consisting of complete sets including rails, hangers, supports, bumpers, floor guides and all hardware required for a complete installation.

2.10 SECURING DEVICES (LATCHING SYSTEMS)**A. Fire-Rated Security Privacy Unit**

1. At all entry units, provide security privacy unit, auxiliary device that meets fire rating.
2. Acceptable Manufacturers and Series:
 - a. Pemko #PDL or approved equal.

B. Electronic Security Lock System Description

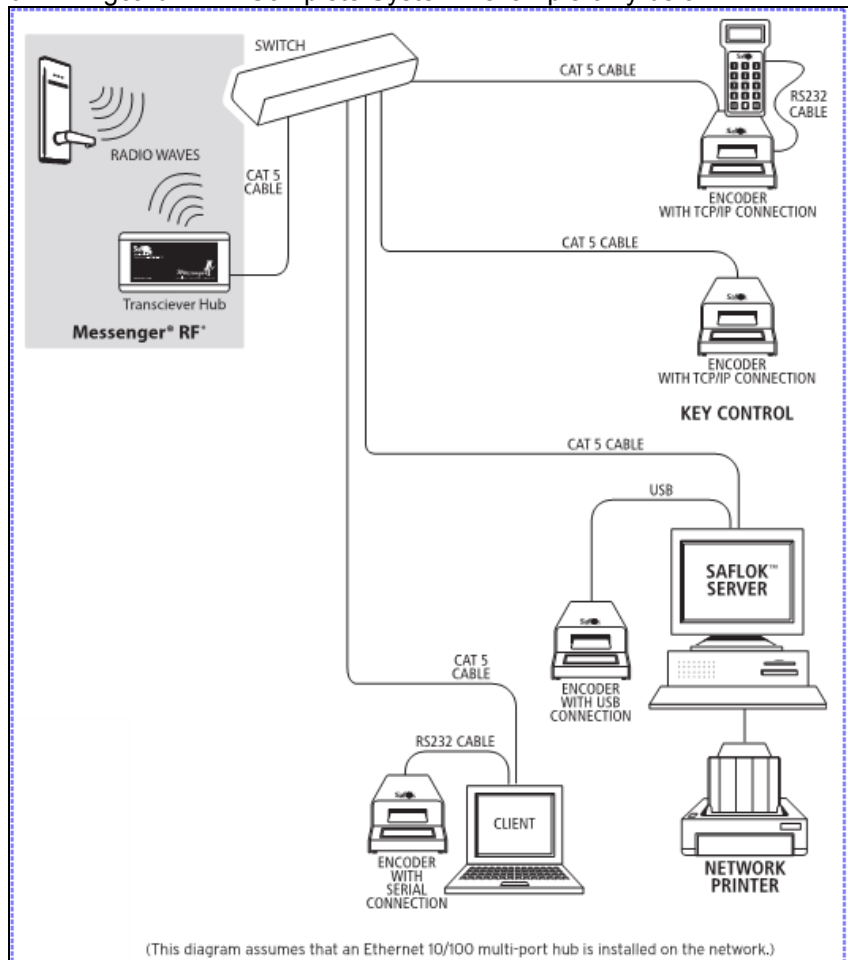
1. Install an electronic lock system, complete and including without limitation, the following components:
 - a. VingCard Radio Frequency Identification (RFID) electronic hotel lock system x project lever x prep for non-interchangeable cylinder. Provide levers to return to door within 1/2 inch to meet California requirements. VingCard Project standard - Deductive alternate to be considered by Saflok if Saflok can meet all project specifications, lever hardware and cell phone/iPad technology for controlling and opening doors.

- 1) Provide Auto Deadbolt Option (ADB) at all Guestroom Entry Doors

2. **RFID Guest Room Locking System, Front Desk System**

The following is not in OCI scope. For pricing purposes - ACM to review and verify who will specify the following systems in detail:


- b. Vingcard RFID Complete System - example only below:



- c. Microprocessor based Front Desk Controller System shall be a PC base motorized key encoding system with remote system printer and lock integration (LPI) feature. Include the following:
 - 1) *VingCard* Main PC Base computer, RS232 Cable and support hardware.
 - 2) *VingCard* [2][1] Each Motorized keycard encoder station and power supply.
 - 3) *VingCard* 1 Each Basic System Items: Manuals, etc.
 - 4) *VingCard* 1 Each System Printer with Serial Cable
 - 5) *VingCard* Keycards: Generic reusable plastic magnetic keycards. Quantity: 1700 and 300 emergency keycards. Quantity: 2000.
- b. System shall be designed for the following features:
 - 1) Password access to front desk system
 - 2) Transaction log of last 4,000 transactions
 - 3) Simple three-step check in progress
 - 4) Encoder to be motorized or insertion type
 - 5) Encoder must encode and validate cards
 - 6) Encoder must be able to "read a card"
 - 7) Back-up Fail-safe key cards in case of catastrophic power failure
 - 8) Portable programmer interrogator: Password protected and be able to program up to 250 locks. Shall be separate from Front Desk Controller, furnish two Front Desk Controllers. 50 locks. Program shall include:
 - a) Set time clock
 - b) Perform diagnostic check
 - c) Interrogate up to last 100 entries: time, date and card identification
 - 9) Front Desk Controller to have "hot" keys for front desk check-in type function.
 - 10) Front Desk Controller must have capability of adding a secondary station that communicates with Primary Front Desk Controller in order to prevent double issuing keys for rooms.

Wall Mounted, Hard-Wired Card Reader Devices - not in OCI scope at this time

- d. See below for picture example:

Wall Mounted, Hard-Wired Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge or EPT then length of wire inside the door)	<i>VingCard</i> Essence RFID Remote Control Unit" 
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- c. Guest Room: Locks shall be opened by a correctly coded card, upon removal after insertion. Use of a newly issued card shall automatically re-key the lock to void the previous card, and guest cards shall additionally self-cancel by date and time automatically. Perimeter door reader to allow authorized guest cards. Canceled cards must not access perimeter reader.
 - 1) Audit trail in lock of last 100 entries - time, date, and card identification
 - 2) Office/passage function by card for offices, entry doors or hospitality suites
 - 3) Reusable ABA standard magstripe cards
 - 4) Four (4) standard AA batteries or a (4) AA battery pack

- 5) Non-volatile memory lock will not lose program even if the batteries are removed
 - 6) Up to Four levels of master/staff cards; 50 masters per level
 - 7) Staff cards shall be individualized to identify individual card holder via lock audit
 - 8) All cards are time limited
 - 9) For Finish and Lever design see hardware sets
 - 10) Deadbolt override cards for emergency level and guest cards (programmable).
 - 11) Simultaneous retraction of deadbolt and latchbolt (1" steel dead bolt with security pins and 3/4" anti-friction latch bolt).
 - 12) Intelligent power shutdown feature. Batteries remain deactivated until keycard is inserted. Master level card key will activate a flashing red LED "Low Battery" light warning system three (3) months 30 days in advance of battery failure.
 - 13) Mortise lockset to conform to BHMP Grade One, and meet UL Fire Rating C through A
 - 14) Exterior door applications shall have special weather protection stand.
- d. Demonstration Unit: Guest Room lockset, mounted in a finished hardwood stand.

B. Intercom System: Type: "LEM-1 DLS System"; Aiphone Corp. (800-692-0200).

1. Products:
 - a. Avendra, LLC Preferred Manufacturers:
 - 1) None
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide "LEM-1 DLS System" by Aiphone Corporation.
 - 1) No Substitutions
2. Complete intercom system including, but not limited to, master unit, door station, power supply and substations, if applicable.
 - a. *Master Unit* *LEM-1*
 - b. *Door Station Transmitter L-ED*
 - c. *Power Supply* *PT120NS*

C. Cylindrical, Non-Card Swipe Locksets and Latchsets

1. Provide ANSI Grade 1 devices where specified in hardware groups/sets (Part 3).
 - a. Grade 1 Cylindrical Locksets shall be a BHMA Certified Product, meeting requirements per ANSI A156.2, 1996.
2. Acceptable Manufacturers:
 - a. Schlage Lock Co. ND Series and S Series (as specified).
 - b. Sargent 10-Line grade types to match specified ANSI grade series in hardware groups/sets (Part 3).
 - c. Yale 5400LN and/or grade types to match specified ANSI grade series in hardware groups/sets (Part 3).
 - d. Corbin/Ruswin CL3300 Series and/or grade types to match specified ANSI grade series in hardware groups/sets (Part 3).
3. Levers
 - a. Provide levers as specified with to return to door within 1/2" at public spaces or

corridors.

4. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Backsets: 2-3/4 inches.
 - b. Where indicated in Architectural drawings, door schedule or details provide lead lined devices.
 - c. Strikes:
 - 1) Provide ANSI 4-7/8" standard strike.
 - 2) Provide Curved Lip-type strike at all locations if possible to prevent catching clothing or other objects on strike. Where required provide detail and provide flat strike where required.
 - 3) Where required provide extended lip strike so that the lock or latchset latch will not come in contact with frame or added trim on or adjacent to the frame (example: Don Jo device #MEST-104, but provide submitted manufacturer equal extended lip strike).

D. Roller Latches: BHMA A156.16; Grade 1.

1. Manufacturers:
 - a. Triangle Brass Manufacturing Company, Inc. (Trimco).
 - b. McKinney Products
 - c. Rockwood.
 - d. Hager Manufacturing.
 - e. Ives Manufacturing.
2. Provide and install roller latches for top of door (side latching is not acceptable).
3. Provide rolling plunger that engages socket or catch with adjustable roller projection.

E. Exit Devices and Removable Mullions.

1. Provide ANSI Grade 1 devices where specified in hardware groups/sets (Part 3).
 - a. Grade 1 Exit Devices: shall be a BHMA Certified Product, meeting requirements per ANSI A156.3, Grade 1; UL Listed.
2. Acceptable Manufacturers (devices not connected to the Ving or Saflok Manufacturing RFID series):
 - a. Advantex (ANSI Grade)
 - b. Von Duprin.
 - c. Sargent 80 Series.
 - d. Yale 5400LN Series.
 - e. Corbin/Russwin CL3300 Series.
3. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Exit devices shall be UL listed for panic. Exit devices for labeled doors shall be UL listed as "Fire Exit Hardware".
 - b. Provide cylinders for exit devices with locking trim and cylinder dogging. Provide cylinder dogging feature for non-rated exit devices.
 - c. Where removable mullions are not specified in hardware groups, provide keyed removable mullions at all locations in order for door to properly latch and secure rooms and buildings with rim or mortise type exit/panic bar devices.

- 1) Provide stabilizers for removable mullions at all locations.
- d. Trim:
 - 1) Where lever trim is specified, provide lever design to match specified Schlage, ANSI grade 1 lockset levers.
- F. L-Shape Exit Devices (Typical Glass - Egress Out Swinging Doors)
 1. Manufacturers:
 - a. CR Laurence (as specified)
 - b. Blumcraft
 - c. PRL Manufacturing
 2. Provide L-shaped Egress, exit bar for doors as required (630 polished finish).
 3. Provide locking trim / cylinder dogging features with free egress at all times.
 4. Provide cylinders for exit devices with locking trim / cylinder dogging.
- G. Electric Strikes
 1. Acceptable Manufacturer:
 - a. HES Manufacturing, Inc.
 - b. Approved Manufacturers if meeting specifications:
 - 1) Folger-Adam Manufacturing, Inc.
 - 2) SDC.
 - 3) Adams Rite.
 2. Specifications shall meet: ANSI/BHMA 156.31, Grade 1; UL 1034, burglary-resistant listed; ANSI A250.13-2003 listed; UL 10C, 3 hour fire-rated (fail secure only); NFPA-252 fire door conformant; ASTM-E152 fire door conformant. Provide dual interlocking plunger design and heavy-duty, all stainless steel construction, tested to exceed 3,000 lbs. of static strength, 350 ft. lbs. of dynamic strength, and factory tested to exceed 1,000,000 cycles of operation.
 3. Provide electric strikes designed for use with the type locks shown at each opening where specified.
 4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.
 5. For all electric strike locations, provide HES "SmartPac III" In-Line Power Control (or equal product to meet specified requirements): 2005 SmartPac II device is an in-line power control that is able to receive input voltages from 12 to 32V AC or DC. The built-in bridge rectifier provides 12 or 24VDC output. Under continuous duty operation, the output VDC is reduced by 25% to extend the life of the electric strike. The SmartPac III includes an in-line fuse, MOV to protect against possible inrush and reverse surges, and a 2-8 second adjustable timer. Standard Features include: selectable 12 or 24 volt DC output options; Built-in bridge rectifier; Built-in surge protection / voltage regulation; Activation timer (keeping strike energized for set period of time, adjustable from 2-8 seconds); Continuous duty timer (reducing initial voltage by 25% after set period of time adjustable from 2-8 seconds, which provides cooler operation of strike).
- H. Flush Bolts and Dust Proof Strikes
 1. Acceptable Manufacturers:
 - a. Triangle Brass Manufacturing Company, Inc. (Trimco).
 - b. McKinney Products
 - c. Rockwood.

- d. Hager Manufacturing.
- e. Ives Manufacturing.
- 2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Non-labeled Openings - where not specified in hardware sets: Provide supply 2 flush bolts for inactive leaf of pairs of locked and latched doors. Locate centerline of top bolt not more than 78 inches from finished floor. Provide dustproof strike for bottom bolts (type as required for floor condition).
 - b. Labeled Openings - where not specified in hardware sets: Provide automatic flush bolt set as applicable, for inactive leaf of pairs of doors. Provide dustproof strike for bottom bolts (type as required for floor condition).
- I. Coordinators
 - 1. Manufacturers:
 - a. Triangle Brass Manufacturing Company, Inc. (Trimco).
 - b. McKinney Products
 - c. Rockwood.
 - d. Hager Manufacturing.
 - e. Ives Manufacturing.
 - 2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Provide coordinator for fire rated or smoke labeled pairs of doors equipped with automatic flush bolts and those with vertical rod/mortise lock fire exit device combinations with astragals.
 - b. Provide filler bars for total opening width, closer mounting brackets (to allow proper installation of stop mounted hardware without damaging coordinator), carry bars and special preparation for top latches where applicable.

2.11 KEY SYSTEMS (CYLINDERS, CORES AND KEYS)

- A. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device (keying specifications below override hardware set/group nomenclature):
- B. For all locking or dogging devices, provide complete keying system whether or not specified in 087100-Part 3 hardware sets (below) including lock cores, mortise cylinders and rim cylinders keyed as directed by Owner in submittal process. Key System to be:
- C. Basis-of-Design Product:
 - 1. Locksets and cylinders shall contain 6-pin tumblers.
 - 2. "1345"; Schlage, an IR Ingersoll-Rand Business
 - 3. Subject to compliance with requirements, provide Cylinder Model "VA" by Sargent Manufacturing Co., An ASSA ABLOY Group Company, or comparable product by one of the following:
 - 4. All locksets shall have manufacturer's restricted keyway, reserved for Owner's use only.
 - 5. Keyway: Provide as instructed by Owner during submittal process.

DOOR HARDWARE

D. Keying Requirements

1. Provide keyed, construction cores and keys during the construction period:
 - a. Provide brass construction cores and brass keys at the following: Exterior doors (including but not limited to exterior unit entry doors, patio doors and gates) and electrical interior rooms.
 - b. Plastic cores are to be provided at all other doors with keying systems.
 - c. Construction control and operating keys and core shall not be part of the University's permanent keying system or furnished in the same keyway (or key section) as the University's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.
2. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."
3. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.
4. Furnish keys in the following quantities:
 - a. 5 each Grand master-keys per set.
 - b. 6 each Masterkeys per set.
 - c. 3 each Change keys each lock, core or cylinder.
 - d. 5 each Permanent Extractor keys.
 - e. 25 each Construction masterkeys.
 - f. 5 each Construction Core Extractor keys.
5. Keying Schedule: After hardware has been submitted in accordance with Division 01 and 087100 requirements, arrange for a keying meeting and programming meeting with Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Follow procedures of DHI (Door Hardware Institute) and Furnish 3 typed copies of keying and programming schedule to Architect.
 - a. Hotel System-Master Keying: Coordinate with Owner based upon the following general requirements.
 - b. Administrative Master Key "AA" - Operates all locks in the administrative and office areas of the hotel.
 - c. Engineering Master Key "AB" - Operates all locks in the engineering and maintenance areas, (i.e., engineer's office, entire maintenance section, mechanical and electrical rooms, utility closets, janitor's closets, and all exterior doors, including the roof).
 - d. Food and Beverage Master Key "AC" - Operates all locks under the direct supervision of the steward, (i.e. kitchen, banquet rooms, food storage rooms, dining rooms and kitchen offices).
 - e. Housekeeping Master Key "AD" - Operates all locks under the direct supervision of the housekeeper, (i.e., housekeeper's office, pantries, linen rooms and linen chutes on guest floors and laundry room area).
 - f. Health and Exercise Master Key "AE" - Operates all locks in the health/exercise areas, (i.e., swimming pool, exercise room, pool lockers and game room).
 - g. Grand Master Key "A" – Operates locks as noted in paragraphs a through e above. Upon authorization of the Owner, keyblanks shall be sold only by direct main from the door lock manufacturer.
 - h. Keyed alike in sets, each set different.

- i. Electrical and telephone closets.
 - j. Two or more doors to or from the same room area or space.
 - k. Public meeting room doors in accordance to areas subdivided by operable partitions.
 - l. Linen rooms and chute area doors.
 - m. Hotel System - Temporary Construction Keying:
- 6. Install permanent cores in presence of Owner.
- E. Fire Control Key Boxes:
 - 1. Product.
 - a. Rapid Entry System
 - 2. Manufacturer and Product.
 - a. Basis of design: Knox Box 3200 Series x The Knox Co.
 - 3. Details and quantity.
 - a. Furnish and install four (4) rapid entry system knox boxes at locations indicated on plans.
 - b. Furnish recessed mount, UL-listed, heavy-duty unit; fabricate from 1/4-inch-thick steel plate.
 - c. Furnish with restricted keying as required by Local Fire Department.
 - d. Furnish one box at each main entry from each parking area designated with a fire emergency lane.
 - e. Furnish tamper alarm switch with each box.
 - f. Furnish outlet boxes, conduit, wiring, and connections as specified in appropriate Division 25-28 Sections.
- F. Key Cabinets
 - 1. Manufacturer & Basis-of-Design:
 - a. "Regent RWC Series"; Telkee, Inc., (302-678-7800). Wall mounted lockable key cabinet complying with ANSI/BHMA A156.5.
 - 2. Approved Manufacturers (if meeting specifications below):
 - a. Lund Deluxe wall type cabinet, Series 1200
 - b. Key Control Manufacturing
 - 3. Size: Sized for actual quantities of keys, plus 25%, plus additional capacity for 12 housekeeper pouches.
 - 4. One wall mounted lockable key cabinet for four (4) key rings.
 - 5. One key control log book.
 - 6. Provide two (2) sets of color coded and numbered tags for key ring identification.
- G. Key Management Software
 - 1. Provide key management software: Sitemaster 200 3.0 version system by Schlage lock manufacture; or Key Wizard® key management x ASSA ABLOY key management software.
 - 2. Software shall provide tracking, issuing, collecting and transferring information regarding keys, doors, and hardware.
 - 3. Provide training for Owner's personnel on the proper operation and application of the key management software (8 hours total training time that includes travel expenses by a certified Manufacturer software trainer).

2.12 CLOSING DEVICE

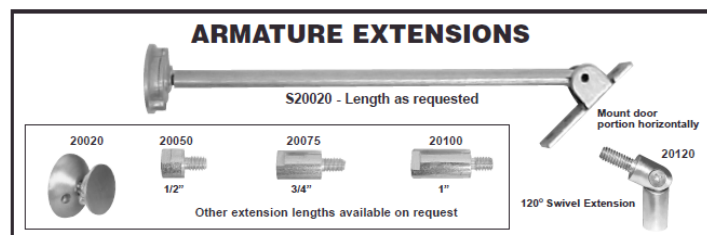
- A. Surface Mounted Closers:
1. Acceptable Manufacturers:
 - a. Norton Door Controls – 7500 Series (as scheduled)
 - b. LCN Manufacturing – 4000 Series.
 - c. Sargent Co. – 281/350 Series or 421 Series.
 - d. Dorma – 8916 Series
- B. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
1. ANSI A156.4, Grade 1; UL Listed; meets UL 10C and S-FM Standard 12-7-4 for positive pressure fire test.
 2. Closers shall have multi-size spring power adjustment to permit setting of spring from 1 through 6 with additional spring power available. Provide ADA compliant setting nomenclature during submittals as recommended by closer manufacturer to meet 1133B.2.5 Door opening force:
 - a. Other than required fire doors, interior doors shall have a maximum opening force of 5 lbf (22.2 N).
 - b. Other than required fire doors, exterior doors shall have a maximum opening force of 5 lb (22.2 N).
 - c. Required fire doors shall have the minimum opening force allowable by the appropriate administrative authority, not to exceed 15 lbf (66.7N).
 3. Submit correct closer type as to be able to install closers on non-public side of doors (examples include but are not limited to 1) interior side of storage/electrical type rooms; 2) not in corridors/public areas 3) stair side of stairway doors; and at exterior locations, install closers inside of building (in conditioned spaces)
 4. Installation Plates, Brackets and miscellaneous adapters:
 - a. Provide drop plates, brackets, or adapters for arms as required to suit details and install as directed by manufacturer's templates.
 - b. Furnish drop plates at narrow top rail doors and parallel-arm closers at reverse bevel doors and at doors with 170 to 180 degrees swing.
 - c. Provide blade or applied stops as required where frame does not permit installation of the standard soffit plate (example only: Norton #2018D Blade/Applied Stop).

2.13 STOPS AND HOLDERS

- A. Overhead Door Holder/Stops
1. Acceptable Manufacturers:
 - a. ABH Manufacturing.
 - b. Glynn Johnson.
 2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Overhead Stops and/or Holders shall meet the requirements of BHMA A156.8, Type 1 (Grade 1).
 - b. Overhead Stops and/or Holders shall have ability to change type of device in field

(change from hold open type to non-hold open or stop only type and vice-versa).

- c. If overhead stops are specified in hardware groups/sets, do not provide wall or floor stops as alternative method of stopping door. Overhead stop door preparation and devices are higher cost items of should be used as initial submittal devices (not lower priced wall or floor stops).
 - d. If manual overhead "stop & hold-open" type devices are specified on fire-rated doors, provide the non-hold open function at time of submittals (no manual hold opens on fire rated doors).
- B. Floor and Wall Door Stops/Holders and Bumpers
- 1. Acceptable Manufacturers.
 - a. Ives Manufacturing.
 - b. Triangle Brass Manufacturing Company, Inc. (Trimco).
 - c. Rockwood.
 - d. Hager Manufacturing.
 - e. McKinney Products
 - 2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. Stops, Bumpers and/or Holders shall meet the requirements of BHMA A156.16 (Grade 1).
 - b. Coordinate with specifications in Division 05, 06 and/or 09 for required wall backing.
- C. Magnetic Door Holders
- 1. Acceptable Manufacturers:
 - a. Rixson Manufacturing.
 - b. ABH Manufacturing.
 - c. Glynn Johnson.
 - 2. Coordinate with Divisions 25-28 for electrical work.
 - 3. Coordinate with specifications in Division 05, 06 and/or 09 for required wall backing
 - 4. At all locations utilizing hold open magnetic devices:
 - a. Install using concealed fasteners. No through bolts or SNB devices allowed.
 - b. Provide correct armature length for doors to be held open at 90 or 180 degrees to be parallel with adjacent wall (example of armature length: see ABH devices directly below this paragraph):



- 5. Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system).

Wiring by electrical.

2.14 ACCESSORIES

- A. Plates (Kick/mop plate)
 - 1. Acceptable Manufacturers:
 - a. Ives Manufacturing.
 - b. Triangle Brass Manufacturing Company, Inc. (Trimco).
 - c. Rockwood.
 - d. Hager Manufacturing.
 - e. McKinney Products
 - 2. Size at single doors:
 - a. Push side of door two inch less than door width (Hardware set/group nomenclature: 2" LDW).
 - b. Pull side and one inch less than door width (Hardware set/group nomenclature: 1" LDW).
 - 3. At pairs of doors provide width one inch less than door width on both sides.
 - 4. Height of 10 inches, unless otherwise indicated.
- B. Push/pull plates
 - 1. Pull & Push Plates (as specified or approved equal)
 - 2. Provide Rockwood pulls at specified doors/openings
 - 3. Provide "F-type" full height pulls by Blumcraft pulls at specified doors/openings
 - 4. Acceptable Manufacturers if manufacturers can meet design intent (provide samples in order to be approved as equal):
 - a. Ives Manufacturing.
 - b. Triangle Brass Manufacturing Company, Inc. (Trimco).
 - c. Rockwood.
 - d. Hager Manufacturing.
 - e. McKinney Products
- C. Smoke Seals, Intumescent Seals, Sound Seals and/or Weatherstripping.
 - 1. Acceptable Manufacturers:
 - a. Pemko Manufacturing, Inc.
 - b. National Guard.
 - c. Zero International.
 - d. McKinney Products.
- D. Light or Sound Seals.
 - 1. Acceptable Manufacturers:
 - a. Pemko Manufacturing, Inc. – Specification Basis of Design: custom powder coated finish 350CSR adjustable seals.
 - b. National Guard.
 - c. Zero International.
 - d. McKinney Products.

2. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device:
 - a. In the field cutting or notching of sound gasket hardware shall not be permitted.
 - b. Provide custom paint, powered coated flat black finish where indicated in hardware group/sets. Custom painting to be done offsite by certified paint vendor and shipped to project site complete (no site painting allowed for powder coat process to meet warranty).
 - c. Submit and supply 350CSR type gasketing in lengths appropriate for template hardware. Examples below are not exhaustive (see hardware and door templating requirements):
 - 1) When Rim-type exit/panic devices are used in conjunction with the 350CSR, order different lengths for 350CSR for latching side jamb to coordinate with - type exit/panic device, surface mounted latch (no seal will be used at the roller-type latch location).
 - 2) When stop mounted overhead closer devices are used in conjunction with the 350CSR, provide the correct drop plates, brackets and/or closer arms to not cur the 350CSR (provide full, header width of 350CSR type devices).
Example: If a parallel arm closer is utilized then provide offset arms (like used for surface mounted overhead stops), drop plates and brackets.

E. Door Silencers

1. Acceptable Manufacturers:
 - a. Ives Manufacturing.
 - b. Triangle Brass Manufacturing Company, Inc. (Trimco).
 - c. Rockwood.
 - d. Hager Manufacturing.
 - e. McKinney Products

F. Astragals, Door Bottoms & Thresholds

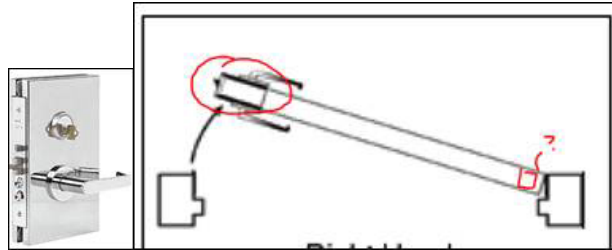
1. Acceptable Manufacturers:
 - a. Pemko Manufacturing, Inc.
 - b. National Guard.
 - c. Zero International.
 - d. McKinney Products.
2. All thresholds shall comply with Section 1008.1.6 and 1133B.2.4.1 (not to exceed ½" in height). Refer to drawings for details
3. Where thresholds occur at openings with floor closers provide compliant device (example: Pemko type 13 or 15 series pivot/floor closer devices not to exceed ½" in height). Refer to drawings for details.
4. Provide custom paint, powered coated flat black finish where indicated in hardware group/sets. Custom painting to be done offsite by certified paint vendor and shipped to project site complete (no site painting allowed for powder coat process to meet warranty).

G. Drip Guard:

1. Provide at exterior doors exposed to rain.
2. Size: Full Frame Width (FFW).
3. Provide devices painted to match adjacent frame in accordance with Division 09 for paint and primer requirements.

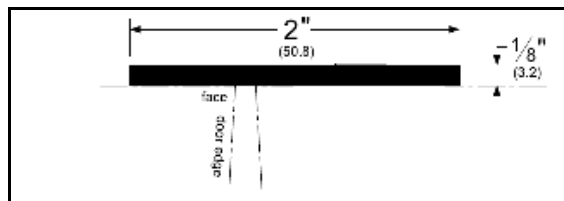
H. Gates & Gate Hardware Accessories

1. Provide welded astragals, lock patches (templates) and/or welded mounting devices required for a complete installation of specified hardware (whether or not shown in Architectural Drawings/Details).
 - a. Weld in accordance with manufacturer's recommendations.
 - b. Coordinate with other welding requirements in Contact Documents.
 - c. Provide devices ground smooth and painted to match gate/fence system – see Division 09 for paint and primer requirements
 - d. Inserted pictures below are only examples of lock patches and/or welded mounting devices (template gates for each type of hardware device):



2. Gate Astragal:

- a. Provide full gate height, fully welded astragal to overlap either adjacent fence post or the adjacent door where opening is pair gates (double door openings).
 - 1) Provide full height astragal width per architectural details, but if not indicated provide astragal width no less than 2" wide (see inserted picture below).
 - 2) Provide full height astragal overlap width per architectural details, but if not indicated provide overlap of astragal no less than 3/4" wide (see inserted picture below).
 - 3) Provide 1/8" (one-eighth inch) astragal thickness (see inserted picture below).
 - 4) If Pemko manufacturing 357 series astragal is utilized by gate manufacturer, do not use screws or order with screw holes (nomenclature ND prefix or suffix required by Pemko on astragal #357 device).



- b. Provide devices ground smooth and painted to match gate/fence system (see Division 09 for paint and primer requirements).

3. Gate Cainbolt(s):

- a. Where nomenclature or device # "524 Series" non-padlock cainbolt-type devices are specified in hardware group/sets, provide series by Crown Industrial (So. San Francisco, CA; (650) 952-5150; <http://www.crown-industrial.com/>, or equal.
- b. Where nomenclature or device # "stock #0524PL and/or part #0000478" series

padlock lockable cane-bolt-type devices are specified in hardware group/sets, provide series by Crown Industrial (So. San Francisco, CA; (650) 952-5150; <http://www.crown-industrial.com/>, or equal.

- c. On the pair of gates that have an egress lever trim and or exit/panic device push-pad trim on active side gate install cane-bolt away from the door edge so that both the cane-bolt and supplied the padlock cannot not impede the active door from opening at any time (free egress).
- d. Provide compatible galvanized steel pipe cane-bolt receptor and strike plate mounted in concrete slab as required.
 - 1) At lockable cane-bolts (by padlock) provide sufficient cane-bolt receptor depth to enable use of padlock.
 - 2) Provide cane-bolt receptors at both closed position of gate as well as open position of gate at 90° (degree) unless shown differently by per architectural details.
- e. Cane-bolts to be mounted and welded in accordance with manufacturer's recommendations.
 - 1) Coordinate with other welding requirements in Contact Documents.
 - 2) Provide devices ground smooth and painted to match gate/fence system – see Division 09 for paint and primer requirements
- f. Products by the following manufacturers will be considered for approval providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents and intended operation.
 - 1) Guardian Gate www.guardiangatehardware.com
 - 2) Ameristar.
 - 3) Monumental Iron Works.

2.15 POWER SUPPLIES, ELECTRIFIED HARDWARE & WIRES

- A. Door Position Switches
 - 1. Acceptable Manufacturers:
 - a. Securitron (as specified)
 - b. General Electric (previously Sentrol Manufacturers)
 - 2. Coordinate door and frame preparations with door and frame suppliers.
 - 3. Door position switches are written in hardware sets to be coordination “place-holders” (do not order final door position switches, but prepare doors and frames as follows). Door and frame supplier to coordinate doors and frames to accept DPS-M or DPS-W devices (doors and frames to be delivered to jobsite with DPS-M or DPS-W cuts/preparations). Final switches shall be provided and installed in pre-cut frame and door head by security vendor. Prepare frames and doors per DPS-M or DPS-W templates (Securitron as basis of design). Switches shall be installed in frame head approximately 4" from latching door edge or as indicated in security drawings.

B. Power Supplies & Relays

1. Where Hardware Groups/Sets have different information (number of hinge wires and power supply information) refer to the following specifications for clarification and submit according to complete and intended electrified system per Contract Documents (see Architectural details and specifications as well as security drawings and specifications) .
 - a. Coordinate use of power supplies with door and frame locations. Provide power supplies, relays and battery backup units as part of the overall system in accordance with the manufacturer's warranty and system requirements. UL listed for applicable use; housed in an approved enclosure; and provide both Class 1 and Class 2 outputs
 - b. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to indicated security components; and shall be assembled, connected, and fully contained within the power supply enclosure.
 - c. Provide required connections to fire alarm/life safety system and for remote site activation of all electrified components and functions.
 - d. For all electric strike locations, provide HES "SmartPac II" In-Line Power Control (or equal product to meet specified requirements).

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine doors and frames and verify mounting locations as indicated on shop drawings.
- B. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions and approved shop drawings.
- B. Hardware placement:
 1. General: Comply with Title 24, CCR and ANSI A117.1.
 2. Except for hinges, do not install hardware until painting and finishing work is completed.
 3. Unless otherwise shown or **required by CBC 2010**, place hardware at the following heights:
 - a. Hinges: Door and frame manufacturer's standard.
 - b. Latchset and lockset lever or hospital paddle-type handle: 38 inches A.F.F. (above finish floor/surface)
 - c. Panic Devices: Levers to be 38" above finish floor/surface (matching typical latchset and lockset levers).
 - d. Door Pulls and Push Bars (centerline): 42 inches.
 - e. Push Plates (centerline): 42 inches.

- C. Door-Floor Clearances: Unless otherwise shown, provide the following door-floor clearances:
 - 1. Labeled doors: 3/8 inch maximum over floor or threshold.
 - 2. No threshold: 3/4 inch maximum for metal doors; 5/8 inch maximum for wood doors.
 - 3. With threshold: 1/8 inch.
 - 4. Carpet: 1/8 inch over top of nap.
- D. Installation:
 - 1. General: Pre-drill pilot holes in wood for screws. Drill and tap for surface mounted hardware on metal.
 - 2. Hinges: Set hinges snug and flat in mortises. Hand turn screws to flat seat – do not drive.
 - 3. Floor closers (Rixson or Dorma as specified) to have cement case either Rixson #253000-PKG type cement case or as required for each floor closer location. Cement case to be delivered and installed in floor slabs before cement is poured. Additional floor closers device materials to be delivered and installed with remainder of finish door hardware.
 - 4. Closers: Mount door closers for maximum swing of door before setting stops. Adjust closers so that from open position of 70 degrees, the door will take at least three seconds to move to a point 3 inches from the latch.
 - 5. Silencers: Set in place before adjusting strikes.
 - 6. Locksets: Install locks with keyways in proper position. Install levers, roses, and escutcheons firmly affixed.
 - 7. Thresholds and Raindrips: Set in waterproof sealant and fasten anchors in pre-drilled countersunk holes 18 inch on center maximum spacing and within 3 inch of each end. Minimum 2 anchors per threshold.
 - 8. Raindrips: Set in waterproof sealant and fasten as recommended by manufacturer.
 - 9. Floor Stops: Floor stops shall be installed a maximum of 4 inch from adjacent walls.
 - 10. Auto Door Bottom (411 or 420 series as typically specified) to not be adjusted until substantial completion. Door bottoms are to be raised to highest position while construction occurs (so to not have rubber seal torn or damaged by debris under the door). At substantial completion, adjust door bottom to fully engage and touch the floor for proper sound dampening.

3.3 PAINT OR FIELD FINISHES

- A. Coordinate with Contact Documents including but not limited to Division 09 for paint and primer requirements.

3.4 ADJUSTING

- A. Adjust parts for smooth, uniform operation.
- B. Lubricate moving parts with manufacturer recommended lubricant.
- C. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.

D. Adjust door closer devices:

1. Adjust closer operating effort to conform to CBC 2010, ADA compliant setting per 1133B.2.5 door opening force:
 - a. Other than required fire doors, interior doors shall have a maximum opening force of 5 lbf (22.2 N).
 - b. Other than required fire doors, exterior doors shall have a maximum opening force of 5 lb (22.2 N).
 - c. Required fire doors shall have the minimum opening force allowable by the appropriate administrative authority, not to exceed 15 lbf (66.7N).
2. Adjust closer delay and operating speeds to comply with requirements of CBC 2010 and Title 24 CCR and the Americans with Disabilities Act Architectural Guidelines.
3. Door closers shall have sweep period adjusted so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3" from the strike. CBC 2010.

3.5 CLEANING

- A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish or surrounding construction.

3.6 HARDWARE SCHEDULE

A. Manufacturers Legend:

<u>Code</u>	<u>Name</u>
IV	H.B. Ives Manufacturing
AD	Adams Rite Manufacturing
AB	ABH manufacturing
DO	Dorma Manufacturing
PE	Pemko Manufacturing
BL	Blumcraft Manufacturing (PA100Z below is manufactured by CR-Laurence, the manufacturer that owns Blumcraft)
RO	Rockwood Manufacturing
RX	Rixson Manufacturing
- VI	VingCard Manufacturing
SC	Schlage Manufacturing
SE	Securicraft Manufacturing
SN	Securitron Manufacturing
SI	Simonswerk Manufacturing
FO	Foldger-Adams Manufacturing
TR	Trimco Manufacturing
VO	Von Duprin Manufacturing
HE	HES Manufacturing

B. Hardware Columns - Example (Legend):

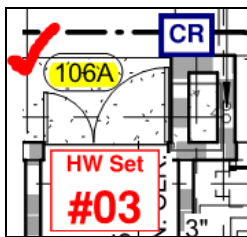
Qty	Device Description	Device # (include specification language)	Finish	Manu
1	-----	-----	--	--

C. The "Request-to-Exit" feature as described below is a security feature that announces/tells the security system if occupants is leaving the building interior area and similar to a motion-sensor the "Request-to-Exit" switch or device does not affect egress of the doors (unless noted, all doors in hardware group/sets are free egress at all times with no special knowledge to exit).

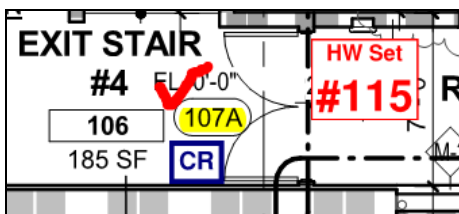
D. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section (see above section and related sections including Division 01).

1. Examine Contract Documents and furnish proper hardware for door openings.
2. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.
3. **The following information will effective hardware group/sets below (where hardware groups/sets have different information refer to the following for clarification, provide hardware groups/sets devices along with added devices below):**

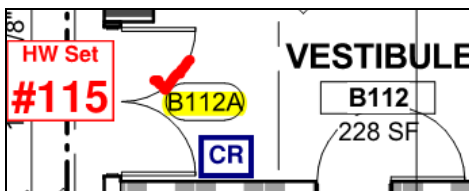
- a. **Door 106A to stay with bid surface vertical rods. Fire bolts (no bottom rods unless required). If bottom rod required, then provide Trimco device #PG8002-1 (or coordinated equal).**



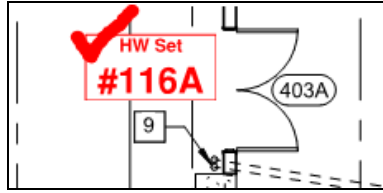
- b. **Door 107A to stay with bid surface vertical rods. No bottom rods.**



- c. **Door B112A to stay with bid surface vertical rods. Fire bolts (no bottom rods unless required). If bottom rod required, then provide Trimco device #PG8002-1 (or coordinated equal).**




- d. **Door 403A (also with nomenclature 9927) to stay with bid surface vertical rods. No bottom rods.**



- ~~3.4.~~ Blank space below is intentional to preclude splitting a Hardware Group/Set onto two pages.


HARDWARE GROUP/SET #01

2	Ea.	Pivot Set	OP440 Pivot Set (3/4" offset hung, single acting or equal to match overhead low energy operator)	626	DO
2	Ea.	L-Shaped, Top Latching Exit/Panic Device	H-100 (exterior keyed x interior keyed dogging feature) x Blumcraft full height F-pull at exterior	630	BL
4	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
4	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Electrified Strike (fail secure)	310-1 or series required for application (for double door(s)) FSE ¾" straight keepers	630	FO
1	Ea.	Overhead Low Energy Operator System	See Section 08 71 13		
2	Ea.	Floor Stop	#DS1X02	630	IN
2	Ea.	Door Bottom Sweep	90100CNB x Tek Screws		PE
1	Ea.	Threshold	2548A (width to suit jamb thickness) x Type 11, 13 or 14 (per pivot detail) – coordinate with architectural detail x FHSL25 fasteners		PE
2	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		
1	Ea.	Electrified Strike Power Supply	BPS-24-2		SN
1	Ea.	Wall Mounted, Hard-Wired Card Reader/Swipe Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length of wire inside the door)	VING Manufacturing "Remote Control Unit" series as pictured to right with rain-hood at exterior locations (coordinate with divisions 25-28 & applicable drawings)		
1	Ea.	Remote Entry & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length of wire inside the door)	PB3ER (coordinate with divisions 25-28 & applicable drawings)		

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents). At non-rated openings, provide Von Duprin or approved equal with no Fire Bolt or –F fire rating nomenclature.

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HARDWARE GROUP/SET #02

2	Ea.	In-Floor Closer	Offset Hung SC PH 8.5 27 x 180 degree device x NHO	626	RX
2	Ea.	L-Shaped, Top Latching Exit/Panic Device	H-100 (exterior keyed x interior keyed dogging feature) x Blumcraft full height F-pull at exterior 	630	BL
4	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
4	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Electrified Strike (fail secure)	310-1 or series required for application (for double door(s)) FSE ¾" straight keepers	630	FO
2	Ea.	Floor Stop	#DS1X02	630	IN
2	Ea.	Door Bottom Sweep	90100CNB x Tek Screws		PE
1	Ea.	Threshold	2548A (width to suit jamb thickness) x Type 11, 13 or 14 (per pivot detail) – coordinate with architectural detail x FHSL25 fasteners		PE
2	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		
1	Ea.	Electrified Strike Power Supply	BPS-24-2		SN
1	Ea.	Wall Mounted, Hard-Wired Card Reader/Swipe Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length of wire inside the door)	VING Manufacturing "Remote Control Unit" series as pictured to right with rain-hood at exterior locations (coordinate with divisions 25-28 & applicable drawings)		VI

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents). At non-rated openings, provide Von Duprin or approved equal with no Fire Bolt or –F fire rating nomenclature.

HARDWARE GROUP/SET #03

–	Ea.	Hinge	5BB1 HW x 5" Tall x NRP (width size & quantity per 08 7100)	652	IV
2	Ea.	Electrified Hinge	5BB1 HW TW8 (size per 08 7100)	630	IV
1	Ea.	Fire Rated Electrified Concealed Vertical Rod Exit/Panic Device - Lever	RX QEL 9927L-F x 996L R&V x 06 LBR x Fire Bolt	626	VO
1	Ea.	Fire Rated Electrified Concealed Vertical Rod Exit/Panic Device (EO)	RX 9927EO-F x LBR x Fire Bolt	626	SA
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	Surface Closer With Stop Arm	8916 DS	626	DO
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
2	Ea.	Split Astragal	29324CNB		PE
2	Ea.	Door Sweep	315CN x Tek Screws		PE
1	Ea.	Threshold	2727C or 176A (or per detail - sized to fit the condition)		PE
1	Ea.	Overhead Rain Drip	346C X FFW		PE
2	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		SN
2	Ea.	Request to Exit Device	Specified in above locking hardware		
1	Ea.	QEL Power Supply	PS914-4RL (coordinate with divisions 25-28 & applicable plans)		VO
1	Ea.	Wall Mounted, Hard-Wired Card Reader/Swipe Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length of wire inside the door)	VING Manufacturing "Remote Control Unit" series as pictured to right with rain-hood at exterior locations (coordinate with divisions 25-28 & applicable drawings)		VI
1	Ea.	Remote Entry & Access Control (including but not limited to wire & connectivity	PB3ER (coordinate with divisions 25-28 & applicable drawings)		

DOOR HARDWARE

		from ceiling through frame to electrified hinge then length of wire inside the door)		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents). At non-rated openings, provide Von Duprin or approved equal with no Fire Bolt or –F fire rating nomenclature.				

HARDWARE GROUP/SET #04

-	Ea.	Hinge	5BB1 HW x NRP (size & quantity per 08 7100)	630	IV
1	Ea.	Electrified Hinge	5BB1 HW TW8 (size per 08 7100)	630	IV
1	Ea.	Electrified Fire-Rated Rim-Type Panic Device - Lever	RX 99L-F x E996L R&V x 17	626	VO
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	8916 SPA8	689	DO
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	626	IV
1	Ea.	Door Stop	1209	630	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Door Sweep	315CN x Tek Screws		PE
1	Ea.	Electrified Trim Power Supply	PS902 4R		VO
1	Ea.	Threshold	2727C or 176A (or per detail - sized to fit the condition)		PE
1	Ea.	Overhead Rain Drip	346C X FFW		PE
1	Ea.	Request to Exit Device	Specified in above locking hardware		
1	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		
1	Ea.	Wall Mounted, Hard-Wired Card Reader/Swipe Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length of wire inside the door).	VING Manufacturing "Remote Control Unit" series with rain-hood at exterior locations (coordinate with divisions 25-28 & applicable drawings)		VI

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

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HARDWARE GROUP/SET #05

-	Ea.	Hinge	5BB1 HW x NRP (size & quantity per 08 7100)	630	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Surface Closer	8916 AF89 (pull side) or 8916 DS (push side) per 087100 specification	689	DO
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Door Stop	1211 at inswing door only	630	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Door Sweep	315CN x Tek Screws		PE
1	Ea.	Threshold	2727C or 176A (or per detail - sized to fit the condition)		PE
1	Ea.	Overhead Rain Drip	346C X FFW		PE

NOTE: 1: At doors opening out to a 90 degree wall, delete DS arm and furnish 1270CV x 626 finish by Trimco or equal.

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #06

—	Ea.	Hinge	TA2314 x NRP (size & quantity per section 08 7100)	630	MC
1	Ea.	Storeroom-Type Lock	ND80TD (construction keyed with final keying by per below)	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	7500 (pull side) or CPS-7500 (push side) per section 08 7100 specification	689	NO
1	Ea.	Door Stop	441CU (dome stop) at inswinging door applications	626	RO
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Door Bottom Sweep	315CN x Tek Screws		PE
1	Ea.	Threshold	2009APK x CF		PE
1	Ea.	Overhead Rain Drip	346C X FFW		PE
1	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

DOOR HARDWARE

HARDWARE GROUP/SET #07

–	Ea.	Hinge	TA2314 x NRP (size & quantity per section 08 7100)	630	MC
1	Ea.	Auto Flush Bolt-Top Latch With Fire Bolt	FB32 or FB42 (as required per door material wood 20 minutes or non-rated or all hollow metal). For wood doors over 20 minutes in rating, provide top & bottom Flushbolts #FB41P and dust proof strike device #DP4	630	IV
1	Ea.	Storeroom-Type Lock	ND80TD (construction keyed with final keying by per below)	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Coordinator	COR series x filler plates x rated mounting brackets	626	IV
2	Ea.	Closer x Stop arm	CPS-7500	689	NO
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
2	Ea.	Door Sweep	315CN x Tek Screws		PE
1	Ea.	Astragal	355CS x S77D		PE
1	Ea.	Threshold	2009APK x CF		PE
1	Ea.	Overhead Rain Drip	346C X FFW		PE
2	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

HARDWARE GROUP/SET #08

—	Ea.	Hinge	TA2314 x NRP (size & quantity per section 08 7100)	630	MC
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • “1345” keying by Schlage Manufacturing • “VA” keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	7500 (pull side)	689	NO
1	Ea.	Door Stop	441CU (dome stop) at inswinging door applications	626	RO
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	2009APK x CF		PE
1	Ea.	Overhead Rain Drip	346C X FFW		PE
1	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #09

1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • “1345” keying by Schlage Manufacturing • “VA” keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC

For new doors/openings assigned this hardware group/set, the cylinder is for unit-type pricing. At each opening assigned this hardware group/set, provide final keying as required per locking and/or key control devices (examples include but are not limited to Section 08 4229 “Sliding Automatic Entrances”; Section 08713 “Automatic Door Operators” and Coiling Door locking devices and/or control switches that activate or control the on/off switches). Furnish all devices & components for hardware groups/set

DOOR HARDWARE

above in accordance with Contract Documents (including but not limited to notes below, additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #10 (MED HOTEL-BATTERY CARD READER LOCKSET, NO CLOSER)

	Ea.	Hinge	5BB1 (size & quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Permanent Core	20-740	626	SC
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Door Sweeps	315CN x Tek Screws		PE
1	Ea.	Threshold	2727C or 176A (or per detail - sized to fit the condition)		PE

NOTE 1: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Interior Hardware Sets (Three-Digit Set Numbers)

HARDWARE GROUP/SET #101 (OLD SETS #T1 + T1A GUEST ENTRY INCLUDING ACCESSIBLE)

—	Ea.	Hinge	TA2714 (size & quantity per section 08 7100)	652	MC
1	Ea.	Hotel Battery Powered Lockset	RFID series x Auto Deadbolt x Interior ADA Thumbturn x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer with Stop Arm	8616 IS8 (Pull Side)	689	DO
1	Ea.	Kick Plate	KO050 10" x 2" LDW x B4E x CKS	630	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Door Bottom (Sound Dampening)	2343AV		PE
1	Ea.	Threshold	276A or per detail x FHSL25		PE
1	Ea.	Door Viewer	976U	626	TR
1	Ea.	Security/Auxiliary Privacy Unit (per specifications)	PDL	619	PE

NOTE 1: At Accessible Units provide 2 ea. Door Viewers: Install one at 40" AFF and one at 60" AFF or as required by code.

NOTE 2: At doors that open against a wall, delete the stop arm in the closer and provide wall stop 1270CV x 626 finish by Trimco or equal.

NOTE 3: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #102 (OLD SETS #T2 + T2A GUEST BATH INCLUDING ACCESSIBLE)

—	Ea.	Hinge	T2714 (size & quantity per section 08 7100). Prep middle hinge to receive #528 hinge pin stop.	652	MC
1	Ea.	Privacy-Type Latchset	S40D x NEP x 10-025	626	SC
1	Ea.	Heavy Duty Hinge Pin Stop	#528	626	RO
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV

NOTE 1: Standard Hinges above should be used. If opening is less than 36-inches use swing clear hinge below. Delete hinge not used. SWING CLR HGS TA2895 4.5

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract

DOOR HARDWARE

Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #103 (OLD SET #T3 GUEST BEDROOM)

NOTE: Hardware group/set not used at this time

HARDWARE GROUP/SET #104 (OLD SETS #T4 SUITE CLOSET)

NOTE: Hardware group/set not used at this time

HARDWARE GROUP/SET #105 (OLD SET #T5 COMMUNICATING DOORS)

NOTE: Hardware group/set not used at this time

HARDWARE GROUP/SET #106

NOTE: Hardware group/set not used at this time

HARDWARE GROUP/SET #107 (OLD SET #T7 CLOSET DOORS)

NOTE: Hardware group/set not used at this time

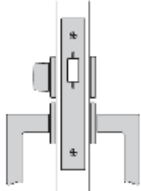




HARDWARE GROUP/SET #108 (Old Sets #T8 Single Suite Closet)

–	Ea.	Hinge	T2714 (size & quantity per section 08 7100). Prep middle hinge to receive #528 hinge pin stop.	652	MC
1	Ea.	Passage-Type Latchset	S10D x NEP x 10-025	626	SC
1	Ea.	Heavy Duty Hinge Pin Stop	#528	626	RO
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV

NOTE 1: Standard Hinges above should be used. If opening is less than 36-inches use swing clear hinge below. Delete hinge not used. SWING CLR HGS TA2895 4.5

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #109 (BARN DOOR)

1	Ea.	Barn Door Kit	Exposed track & guide assembly "Slimline Barn Door Slider" complete kit" x stainless steel finish types by Mandy Li Collection (size/width as required per door schedule).		
1	Ea.	Pocket Keyed Lockset x ADA Lever and emergency override or equal by Trimco	Sliding Door Lock E function x FSB Rose x FSB #1075 lever trim x RC ADA full size thumbturn or equal by Trimco (see below)	630	FS
FSB example pictures: Function E Privacy ANSI Code F19 			 		
Trimco: 1074-2x5004 Mortise Sectional Trim with Occupancy Indicator			 		
4	Ea.	Credit Primus I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC
4	Ea.	Credit Permanent Core	20-740	626	SC
1	Ea.	Auxiliary Floor Stop	7280	630	TR
<p>NOTE 1: Provide complete system including rails, hangers, supports, bumpers, floor guides (Recessed in-door channels device #C-914) and all hardware required for a complete installation.</p> <p>NOTE 2: Wood Door Fabrication: fabricate doors with WDMA Quality Standards hardware blocking options as follows: Provide HB-3 (which includes HB-1 & HB-2 at top and bottom rail) as well as HB-4 or HB-7 for either latching or pull device blocking (see hardware set/group for latching or pull devices).</p> <p>NOTE 3: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).</p>					

DOOR HARDWARE

HARDWARE GROUP/SET #110 (OLD SET HW SET - T10 INTERIOR STAIRS)

	Ea.	Hinge	T4A3786 (size & quantity per section 08 7100).	652	MC
1	Ea.	Passage Latchset	ND10S	626	SC
1	Ea.	Closer	4011 (pull side) or 4111 EDA per section 08 7100 Specifications so that closers are within the stairwell	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	276A		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #111 (INTERIOR STAIRS WITH EXIT/PANIC DEVICE)

	Ea.	Hinge	T4A3786 (size & quantity per section 08 7100).	652	MC
1	Ea.	Fire Rated Rim Exit/Panic Device with Passage Exterior-Side Lever (non-keyed)	99NL-BE-F x 996L-BE-R/V	626	VO
1	Ea.	Closer	4011 (pull side) or 4111 EDA per section 08 7100 Specifications so that closers are within the stairwell	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	276A		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #112

	Ea.	Hinge	T4A3786 (size & quantity per section 08 7100).	652	MC
1	Ea.	Fire Rated Rim Exit/Panic Device with Passage Exterior-Side Lever (non-keyed)	99NL-BE-F x 996L-BE-R/V	626	VO
1	Ea.	Closer x Stop Arm	4111 x CUSH	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

HARDWARE GROUP/SET #112A

	Ea.	Hinge	T4A3786 (size & quantity per section 08 7100)	652	MC
1	Ea.	Fire Rated Rim Exit/Panic Device with Passage Exterior-Side Lever (non-keyed)	99NL-BE-F x 996L-BE-R/V	626	VO
1	Ea.	Closer	P4111	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

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HARDWARE GROUP/SET #113

	Ea.	Hotel card swipe			
1	Ea.	Fire-Rated Exit Device x RFID Trim (Rim at single doors similar to Von Duprin 99 & Vertical Rod at pairs)	Advantex 10 x RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Closer	4011 (pull side) or 4111 EDA per section 08 71 00 Specifications so that closers are within the vestibule or stairwell	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	276A		PE
1	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		SN

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #113A

	Ea.	Pocket Pivot Hinge	91105F (quantity per 08 7100)	630	IV
1	Ea.	Fire-Rated Exit Device x RFID Trim (Rim at single doors similar to Von Duprin 99 & Vertical Rod at pairs)	Advantex 10 x RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Closer	P4111 EDA	689	LC
1	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
1	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

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HARDWARE GROUP/SET #114

	Ea.	Hinge	5BB1HW (size & quantity per 08 7100)	652	IV
1	Ea.	Fire-Rated Exit Device x RFID Trim (Rim at single doors similar to Von Duprin 99 & Vertical Rod at pairs)	Advantex 10 x RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Closer	4011 (pull side) or 4111 EDA per section 08 71 00	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

NOTE 2: At all doors in the APS room, delete above keying and provide Sargent 6300 series interchangeable core system for final keying by APS vendor.

HARDWARE GROUP/SET #115 AT BASEMENT

	Ea.	Hinge	5BB1HW (size & quantity per 08 7100)	652	IV
2	Ea.	Electrified Hinge	5BB1 HW TW8 (size per 08 7100)	652	IV
1	Ea.	Fire Rated Electrified Concealed Vertical Rod Exit/Panic Device - Lever	RX QEL 9927L-F x 996L R&V x 06 LBR x Fire Bolt	626	VO
1	Ea.	Fire Rated Electrified Concealed Vertical Rod Exit/Panic Device (EO)	RX 9927EO-F x LBR x Fire Bolt	626	SA
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	Surface Closer With Stop Arm	8916 DS	626	DO
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
2	Ea.	Split Astragal	29324CNB		PE
2	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		SN
2	Ea.	Request to Exit Device	Specified in above locking hardware		
1	Ea.	QEL Power Supply	PS914-4RL (coordinate with divisions 25-28 & applicable plans)		VO
1	Ea.	Wall Mounted, Hard-Wired Card Reader/Swipe Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length of wire inside the door)	VING Manufacturing "Remote Control Unit" series as pictured to right with rain-hood at exterior locations (coordinate with divisions 25-28 & applicable drawings)		VI
1	Ea.	Remote Entry & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length	PB3ER (coordinate with divisions 25-28 & applicable drawings)		

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		of wire inside the door)			
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents). At non-rated openings, provide Von Duprin or approved equal with no Fire Bolt or –F fire rating nomenclature. SET #115 - NOTE 2: At all doors in the APS room, delete above keying and provide Sargent 6300 series interchangeable core system for final keying by APS vendor.					

HARDWARE GROUP/SET #116**NOTE: Hardware group/set not used at this time****HARDWARE GROUP/SET #116A – PAIR NON-RATED WITH PULL (PASSAGE DURING DAY, KEYED LOCKED AT AFTER HOURS)**

-	Ea.	Hinge	5BB1 HW x 5" Tall (width size & quantity per 08 7100)	652	IV
1	Ea.	Concealed Vertical Rod-Type Panic Device - non-keyed with pull	CD 9927L NL (110 key override) x LBR	626	VO
1	Ea.	Concealed Vertical Rod-Type Panic Device - non-keyed with pull	CD 9927EO NL (110 key override) x LBR	626	SA
2	Ea.	Pulls	RM2240 x 16" Tall x Rockwood	630	RO
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	Surface Closer	8916 SPA8	689	DO
2	Ea.	Concealed Overhead Stop & Holder	1ADJ (-326 or size as required)	626	RX
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
2	Ea.	Split Astragal	29324CNB		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #117 – SINGLE NON-RATED WITH PULL (PASSAGE DURING DAY, KEYED LOCKED AT AFTER HOURS)

-	Ea.	Hinge	5BB1 HW x 5" Tall (width size & quantity per 08 7100)	652	IV
1	Ea.	Rim-Type Panic Device – Lever	CD 99L x 110NL-MD (as required for door type).	626	VO
1	Ea.	Pulls	RM2240 x 16" Tall x Rockwood	630	RO
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	8916 SPA8	689	DO
1	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Door Stop & Holder	7285		TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					
NOTE 2: At the following doors #310, #310B, 311B and #311C, delete the above stop and furnish, install and coordinate with FLS the following devices:					
1	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
1	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical					

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HARDWARE GROUP/SET #118 – PAIR RATED WITH LEVER (PASSAGE DURING DAY, KEYED LOCKED AT AFTER HOURS X HOLD OPEN FUNCTION)

-	Ea.	Hinge	5BB1 HW x 5" Tall (width size & quantity per 08 7100)	652	IV
2	Ea.	Concealed Vertical Rod-Type Panic Device – Lever	9947L-F x 996L CV x 17 x LBR (at wood doors, provide 9947LWDC-F x 996L trim and provide bottom bolt if fire rating will not allow for LBR and fire bolt)	626	VO
2	Ea.	Pulls	RM2240 x 16" Tall x Rockwood	630	RO
2	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
2	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	Surface Closer	8916 SPA8	689	DO
2	Ea.	At rated (fire or smoke) doors, Wall Mag Holder Device	2100 series x armature extension	689	AB
2	Ea.	At rated (fire or smoke) doors, Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
2	Ea.	At non-rated doors, Door Stop & Holder	7285		TR
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
2	Ea.	Split Astragal	29324CNB		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

HARDWARE GROUP/SET #119 – PAIR RATED WITH LEVER (PASSAGE DURING DAY, KEYED LOCKED AT AFTER HOURS)

-	Ea.	Hinge	5BB1 HW x 5" Tall (width size & quantity per 08 7100)	652	IV
2	Ea.	Concealed Vertical Rod-Type Panic Device – Lever	9947L-F x 996L CV x 17 x LBR (at wood doors, provide 9947LWDC-F x 996L trim and provide bottom bolt if fire rating will not allow for LBR and fire bolt)	626	VO
2	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
2	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	Surface Closer	8916 SPA8	689	DO
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
2	Ea.	Fire Or Smoke Rated Split Astragal	29324CNB		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

HARDWARE GROUP/SET #120 - POOL

	Ea.	Hotel card swipe			
1	Ea.	Fire-Rated Exit Device x RFID Trim (Rim at single doors similar to Von Duprin 99 & Vertical Rod at pairs)	Advantex 10 x RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Closer	4011 (pull side) or 4111 EDA per section 08 71 00	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW x B4E x CS	630	IV
1	Ea.	Door Stop	1270CV (wall stops where possible, but provide Trimco 1211 where required and wall stop cannot be utilized)	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
2	Ea.	Door Sweeps	315CN x Tek Screws		PE
1	Ea.	Threshold	276A		PE
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

HARDWARE GROUP/SET #121 (MED-DUTY HOTEL-BATTERY CARD READER LOCKSET)

	Ea.	Hinge	5BB1 (size & quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	8916 AF89 (pull side) or 8916 SPA8 (push side) per 087100 specification	689	DO
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE 1: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

NOTE 2: at doors without floor or wall stop areas, provide stop arm in closer.

HARDWARE GROUP/SET #122 (HEAVY-DUTY HOTEL-BATTERY CARD READER LOCKSET)

	Ea.	Hinge	5BB1HW (size & quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	8916 AF89 (pull side) or 8916 SPA8 (push side) per 087100 specification	689	DO
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE 1: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

NOTE 2: At the following doors #306, #309 and #318, delete the above wall stop and furnish, install and coordinate with FLS the following devices:

1	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
1	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

HARDWARE GROUP/SET #123 (MED HOTEL-BATTERY CARD READER LOCKSET, NO CLOSER)

	Ea.	Hinge	5BB1 (size & quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE 1: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #124 (MED-DUTY HOTEL-BATTERY CARD READER LOCKSET)

	Ea.	Hinge	5BB1 (size & quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer x Stop Arm	CUSH		
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE 1: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

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NOTE: at doors without floor or wall stop areas, provide stop arm in closer.

HARDWARE GROUP/SET #125

-	Ea.	Hinge	5BB1 HW (size & quantity per 08 7100)	652	IV
1	Ea.	Auto Flush Bolt-Top Latch x Fire bolt	3810 or 3815L(as required per door material - wood or metal) x 3850	626	TR
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Coordinator	3094 x rated mounting brackets		TR
2	Ea.	Surface Closer	8916 AF89 (pull side) or 8916 DS (push side) per 087100 specification	689	DO
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Overlapping Astragal	355CS x S77D		PE

Note 1: At Inswing doors provide 1211 Floor stop x 626 finish By Trimco or equal

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #126

—	Ea.	Swing Clear Hinge	5BB1HW SC 5" as required per opening (quantity per 08 7100)	652	IV
1	Ea.	Auto Flush Bolt-Top Latch x Fire bolt	3810 or 3815L(as required per door material - wood or metal) x 3850	626	TR
1	Ea.	Passage-Type Latchset	ND10S x SPA x 3/4" latch throw	626	SC
1	Ea.	Coordinator	3094 x rated mounting brackets		TR
2	Ea.	Surface Closer	8916 AF89 (pull side) or 8916 DS (push side) per 087100 specification	689	DO
2	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
2	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Overlapping Astragal	355CS x S77D		PE

NOTE: Balance of perimeter seals by door manufacturer. Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

DOOR HARDWARE

HARDWARE GROUP/SET #127

-	Ea.	Swing Clear Hinge	5BB1HW SC 5" as required per opening (quantity per 08 7100)	652	IV
1	Ea.	Auto Flush Bolt-Top Latch x Fire bolt	3810 or 3815L(as required per door material - wood or metal) x 3850	626	TR
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Coordinator	3094 x rated mounting brackets		TR
2	Ea.	Surface Closer	8916 AF89 (pull side) or 8916 DS (push side) per 087100 specification	689	DO
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Overlapping Astragal	355CS x S77D		PE

Note 1: At Inswing doors provide 1211 Floor stop x 626 finish By Trimco or equal

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #128

1	Ea.	Continuous Hinge	SL-24HD (or series to match door and frame variance)	AL	SE
1	Ea.	Invisible Latch	CL11	626	IV

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #129

3	Ea.	Invisible Hinges	TE 640 3D A8 (or TE 640 3D if size of opening dictates the lack of A8 nomenclature).	630	SI
1	Ea.	Passage-Type Latchset	ND10S x SPA	626	SC
1	Ea.	Overhead Stop	10 series	626	TR

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #130

	Ea.	Pocket Pivot Hinge	91105F (quantity per 08 7100)	630	IV
1	Ea.	Auto Flush Bolt-Top Latch x Fire bolt	3810 or 3815L(as required per door material - wood or metal) x 3850	626	TR
1	Ea.	Passage-Type Latchset	ND10S x SPA	626	SC
1	Ea.	Coordinator	3094 x rated mounting brackets		TR
2	Ea.	Pocket Closer	8907 AF PKT 90 or 8907 AF PKT 180 (as required by door swing)	689	DO
2	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
2	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
2	Ea.	Kick Plate	8400 10" X 1" LDW X B4E X CS	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Overlapping Astragal	355CS x S77D		PE
<p>NOTE: Balance of perimeter seals by door manufacturer. Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).</p> <p>Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical</p>					

HARDWARE GROUP/SET #131

	Ea.	Hinge	5BB1 (size & quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x Auto Deadbolt x Interior ADA Thumbturn x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Pocket Closer	8907 AF PKT 90 or 8907 AF PKT 180 (as required by door swing)	689	DO
1	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
1	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Door Bottom (Sound Dampening)	2343AV		PE
1	Ea.	Threshold	276A or per detail x FHSL25		PE
1	Ea.	Door Viewer	976U	626	TR

NOTE 1: At Accessible Units provide 2 ea. Door Viewers: Install one at 40" AFF and one at 60" AFF or as required by code.

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

HARDWARE GROUP/SET #132

	Ea.	Pocket Pivot Hinge	91105F (quantity per 08 7100)	630	IV
1	Ea.	Auto Flush Bolt-Top Latch x Fire bolt	3810 or 3815L(as required per door material - wood or metal) x 3850	626	TR
1	Ea.	Hotel Battery Powered Lockset	RFID series x Auto Deadbolt x Interior ADA Thumbturn x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Coordinator	3094 x rated mounting brackets		TR
2	Ea.	Pocket Closer	8907 AF PKT 90 or 8907 AF PKT 180 (as required by door swing)	689	DO
2	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
2	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Overlapping Astragal	355CS x S77D		PE
2	Ea.	Door Bottom (Sound Dampening)	2343AV		PE
1	Ea.	Threshold	276A or per detail x FHSL25		PE
1	Ea.	Door Viewer	976U	626	TR

NOTE 1: At Accessible Units provide 2 ea. Door Viewers: Install one at 40" AFF and one at 60" AFF or as required by code.

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

DOOR HARDWARE

HARDWARE GROUP/SET #133

-	Ea.	Hinge	5BB1 HW x 5" tall (width & quantity per 08 7100)	652	IV
1	Ea.	Push Plate	1001-3 4" x 16"	630	TR
1	Ea.	Pull Plate	1017-3B 4" x 16"	630	TR
1	Ea.	Surface Closer	8916 AF89 (pull side)	689	DO
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Mop Plate	8400 6" X 1" LDW X B4E X CS	630	IV
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in 08 7100 language above, architectural plans & full specification documents).

HARDWARE GROUP/SET #134

-	Ea.	Hinge	5BB1 HW x 5" tall (width & quantity per 08 7100)	652	IV
1	Ea.	Passage-Type Latchset	S10D x NEP x 10-025	626	SC
1	Ea.	Surface Closer	8916 AF89 (pull side)	689	DO
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Mop Plate	8400 6" X 1" LDW X B4E X CS	630	IV
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #135

-	Ea.	Hinge	5BB1 (size & quantity per 08 7100)	652	IV
1	Ea.	Privacy-Type Latchset	ND40S x SPA x 10-025	626	SC
1	Ea.	Surface Closer	8916 AF89 (pull side) or 8916 DS (push side at outswinging doors)	689	DO
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Mop Plate @ inswing only	8400 6" X 1" LDW X B4E X CS	630	IV
1	Ea.	Wall Stop	1270CV at inswing only	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE 1: Furnish all devices & components for hardware groups/set above in accordance with Contract

DOOR HARDWARE

Documents (including but not limited to additional hardware devices required in 08 7100 language above, architectural plans & full specification documents).

HARDWARE GROUP/SET #136

1	Ea.	Pocket Door Kit	#C-994-104 "Complete Kit" (size/width as required per door schedule).		KN
1	Ea.	Keyed Exterior Side x ADA Thumbturn Interior with Back-to Back Pull Set	2001ADAP-3ST x with special 2-1/2" Backset x Accurate Manufacturing	630	TR
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) - "1345" keying by Schlage Manufacturing - "VA" keyway by Sargent Manufacturing - Or approved equal	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	ADA Pull	1111A	626	TR

NOTE 1: Provide complete system including rails, hangers, supports, bumpers (2 C-100 devices), floor guides (Recessed In-door channels C-914 as required) and all hardware required for a complete installation.

NOTE 2: Wood Door Fabrication: fabricate doors with WDMA Quality Standards hardware blocking options as follows: Provide HB-1 – head and HB-4 for pull device blocking on all doors.

NOTE 3: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #136A

1	Ea.	Bi-Folding Door Kit	# CF-100 BI-FOLDING DOOR SERIES "Complete Kit" (size/width as required per door schedule).		KN
1	Ea.	Keyed Exterior Side x ADA Thumbturn Interior Deadlatch	2001ADAP-3ST (less door pulls) x with special 2-1/2" Backset x Accurate Manufacturing	630	TR
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) - "1345" keying by Schlage Manufacturing - "VA" keyway by Sargent Manufacturing - Or approved equal	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	ADA Pull	1111A	626	TR

NOTE 1: Provide complete system including rails, hangers, supports, bumpers (2 C-100 devices), floor guides (Recessed In-door channels C-914 as required) and all hardware required for a complete installation.

NOTE 2: Wood Door Fabrication: fabricate doors with WDMA Quality Standards hardware blocking

DOOR HARDWARE

options as follows: Provide HB-1 – head and HB-4 for pull device blocking on all doors.
NOTE 3: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #137

-	Ea.	Swing Clear Hinge	5BB1HW SC 5" as required per opening (quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Overhead Stop	10 series (-336 or size as required).	689	RX
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Mop Plate	8400 6" X 1" LDW X B4E X CS (pull side at inswinging into kitchen only)	630	IV
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #138

-	Ea.	Swing Clear Hinge	5BB1HW SC 5" as required per opening (quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	630	IV
1	Ea.	Mop Plate	8400 6" X 1" LDW X B4E X CS (pull side at inswinging into kitchen only)	630	IV
1	Ea.	Wall Stop	1270CV	626	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

DOOR HARDWARE

HARDWARE GROUP/SET #139

-	Ea.	Hinge	T4A3386 5" x NRP (width size & quantity per 08 7100)	630	MC
1	Ea.	Electrified Hinge	T4A3386 5" x QC6 (6-wire x width size & quantity per 08 7100)	630	MC
1	Ea.	Fire-Rated Rim-Type Panic Device x Electrified Fail Safe Lever Trim	RX 99L-F x E996L R&V x 17 (Fail-Safe)	626	VO
1	Ea.	Electrified Trim Power Supply	PS902 4R		VO
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	P4040XP (parallel arm)	689	LC
1	Ea.	Kick Plate	8400 10" X 2" LDW X B4E X CS	626	IV
1	Ea.	Door Stop	1209	630	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Auto Door Bottom	420APKL		PE
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Door Position Switch (also known as Alarm Contact , Door Contact or DPS devices)	Prep/Template door and frame only if DPS devices are specified by security (coordinate door & frame preparation/templates for DPS devices ordered & installed by divisions 25-28 & applicable drawings)		
1	Ea.	Request to Exit Device (see free egress note in above specifications)	Specified in above locking hardware		
1	Ea.	Wall Mounted, Hard-Wired Card Reader/Swipe Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge then length of wire inside the door).	VING Manufacturing "Remote Control Unit" series as pictured to right with rain-hood at exterior locations (coordinate with divisions 25-28 & applicable drawings)		VI

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #140

	Ea.	Hinge	5BB1 (size & quantity per 08 7100)	652	IV
1	Ea.	Hotel Battery Powered Lockset	RFID series x Auto Deadbolt x Interior ADA Thumbturn x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal	626	SC
1	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
1	Ea.	Surface Closer	P4040XP (parallel arm)	689	LC
1	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
1	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Door Bottom (Sound Dampening)	2343AV		PE
1	Ea.	Threshold	276A or per detail x FHSL25		PE
1	Ea.	Door Viewer	976U	626	TR

NOTE 1: At Accessible Units provide 2 ea. Door Viewers: Install one at 40" AFF and one at 60" AFF or as required by code.

NOTE 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

DOOR HARDWARE

HARDWARE GROUP/SET #141 – sent not used at this time

-	Ea.	Pocket Pivot Hinge	91105F (quantity per 08 7100)	630	IV
1	Ea.	Top Manual Flush Bolt	To be 48" long	626	TR
1	Ea.	Deadbolt		626	SC
2	Ea.	Door Stop & Holder	7285		TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE
1	Ea.	Overlapping Astragal	355CS x S77D		PE

NOTE: Balance of perimeter seals by door manufacturer. Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

HARDWARE GROUP/SET #142

-	Ea.	Pocket Pivot Hinge	91105F (quantity per 08 7100)	630	IV
2	Ea.	Concealed Vertical Rod-Type Panic Device – Lever	CD 9947L (-F see below) 110NL	626	VO
4	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal	626	SC
4	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	Pulls	RM2240 x 16" Tall x Rockwood	630	RO
2	Ea.	Surface Closer	8916 SPA8	689	DO
2	Ea.	Door Stop	At non-rated doors provide 7285 or at rated doors, provide 7281 (or per note below)	630	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE: At non-rated doors, provide cylinder dogging as specified above. Whether or not specified for all project smoke or fire rated doors, delete CD cylinder dogging and provide -F Von Duprin nomenclature for rated/UL rated assembly. Update quantity of cylinders and cores as required by locking device. Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

NOTE 2: At the following door #303, delete the above stop and furnish, install and coordinate with FLS the following devices:

2	Ea.	Wall Mag Holder Device	2100 series x armature extension	689	AB
2	Ea.	Wall Mag Armature Extension	S20020 (or length as required for 90 or 180 degree swing parallel to adjacent wall)	689	AB
Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical					

HARDWARE GROUP/SET #143

-	Ea.	Pocket Pivot Hinge	91105F (quantity per 08 7100)	630	IV
1	Ea.	Panic/ Exit Device x RFID Trim (similar to Von Duprin 9947 & Concealed Rod at pairs)	Advantex 10 x cylinder or hex key dogging at interior side x RFID series x US Ship Handle Lever x prep for Schlage IC core	626	VI
1	Ea.	Panic/ Exit Device x RFID Trim (similar to Von Duprin 9947 & Concealed Rod at pairs)	Advantex 10 x cylinder or hex key dogging at interior side x Less Exterior Trim	626	VI
4	Ea.	6-pin Schlage keyway I/C Cylinders (Rim or Mortise)	Per 08 7100 Specifications: I/C Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device) <ul style="list-style-type: none"> • "1345" keying by Schlage Manufacturing • "VA" keyway by Sargent Manufacturing • Or approved equal 	626	SC
4	Ea.	Permanent Cores	23-030 (unit nomenclature provided for pricing, or approved equal)	626	SC
2	Ea.	Surface Closer	8916 SPA8	689	DO
2	Ea.	Door Stop & Holder	At non-rated doors provide 7285 or at rated doors, provide 7281	630	TR
1	Ea.	Seal	If frame is aluminum, then rated seals are to be furnished by rated aluminum frame mfg. If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer.		PE

NOTE: At non-rated doors, provide cylinder dogging as specified above. Whether or not specified for all project smoke or fire rated doors, delete CD cylinder dogging and provide rated/UL rated exit device assembly (VingCard nomenclature as required throughout project). Update quantity of cylinders and cores as required by locking device. Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Description of Operation: When door is placed in opened position, Magnetic Holder will automatically engage hold open mechanism (magnet). Door releases hold open and fully closes door by manual pulling of door or by the following, self-closing functions: 1) Close on fire alarm activation (Verify voltage and coordinate integration with fire alarm system; or 2) Close due to loss of power (coordinate integration with local power system). Wiring by electrical

- END OF SECTION -

- SECTION 08 7113 -**AUTOMATIC DOOR OPERATORS**

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section Includes:
 - 1. Electric, swinging automatic entrances, full energy and low energy with concealed and surface mounting.
 - 2. Actuating controls and safety sensors at designated doors.

1.2 RELATED SECTIONS:

- A. Summary of work: Division 1, applicable sections.
- B. Masonry: Division 4, applicable sections.
- C. Carpentry: Division 6, applicable sections (061000 Rough Carpentry).
- D. Perimeter Sealants; Insulation: Division 7, applicable sections.
- E. Division 8, applicable sections including but not limited to: Wood Doors; Hollow Metal Doors and/or Frames; Storefront; Aluminum Doors and/or Aluminum Frames; Sliding Glass or Framed Doors; All-Glass Doors.
- F. 08 71 00 Door Hardware
- G. Section 26 and 28 - Electrical rough in, wiring & connectors for electrified hardware and card readers.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
 - 1. Refer to Architect's Division 01 (see above for related sections) for definitions, acronyms, and abbreviations.

1.4 COORDINATION

- A. This Section's hardware sets/groups as specified in part three (3) are intended to establish type and design standard when used together with the requirements of this Section, Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections. Examine Contract Documents and furnish proper hardware

for door openings (examples include but are not limited to: if hardware sets/groups are missing fire or smoke rated required devices, provide all devices to meet jurisdictional codes). Where hardware sets/groups have different information then the specifications refer to the specifications and drawings for clarification and bid combined hardware sets/groups and Contract Documents/specifications (provide all combined materials/devices at time of submittals).

- B. Convene coordination meeting between all opening vendors & installers prior to purchasing doors, frames, door hardware and electrical devices required for complete systems. Attendance includes but is not limited to vendor/suppliers and/or installers for hardware; doors, frames; auto operators, security card reader vendor/suppliers and/or installers; and electrical as requires coordination with electrified door hardware.
- C. For card reader interface with applicable door devices, security vendor and/or installer (coordinate accordingly) to have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational card access system. The card reader interface scope includes but is not limited to card reader inputs & output coordination on the electric locking device power supply, electric locking devices and connectivity as well as confirmation of a complete, wired and operational card access system. Provide all required relays & devices as part of the overall system in accordance system requirements.
- D. For auto operator interface with applicable door devices, auto operator vendor and/or installer (coordinate accordingly) to have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational auto operator system. The auto operator interface scope includes but is not limited to connectivity & inputs for push-plates, BEA BR3 (or approved equal required auto operator relays), electric locking devices, as well as confirmation of the complete, wired and operational auto operator system. Provide all required relays & devices as part of the overall system in accordance system requirements.
- E. Provide hardware templates to door and frame manufacturer.
- F. Provide reviewed, hardware schedule submittals to jobsite for use by installation personnel.

1.5 SUBMITTALS

- A. General:
 - 1. Submit in accordance to Division 01 (see above for related sections).
- B. Hardware Schedule: Submit detailed schedule in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute.
 - 1. Schedules which do not comply will be returned for correction before checking. Horizontal-type schedules will be returned for correction before checking.
 - 2. Hardware schedule shall clearly indicate hardware group and manufacturer of each item proposed.
- C. Wiring Information: Provide manufacturers' wiring information including manufacturers' door elevation diagrams for electrified hardware based on Door Hardware Institute (DHI) core class "Electrified Architectural Hardware" (DHI class #COR133. Openings where only magnetic hold-opens or door position switches are specified do not required wiring information. Provide information with hardware schedule submittal for approval. Provide detailed wiring diagrams with hardware delivery to jobsite.

AUTOMATIC DOOR OPERATORS

D. Product Data:

1. Provide 2 copies (or copies as required by Division 01 - see above for related sections) of illustrations from manufacturer's catalogs and data in brochure form.
2. Include labeling and listing information per CBC 2013. Include NFPA 80 (fire rated and smoke-type doors) if applicable.

E. Templates:

1. Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.
2. Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

F. Installation Instructions:

1. Provide manufacturer's written installation and adjustment instructions for finish hardware.
2. Send installation instructions to site with hardware.

1.6 Closeout Submittals**A. Provide operating and maintenance manual that includes the following:**

1. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
2. Catalog pages for each product.
3. Name, address, and phone number of local representative for each manufacturer.
4. Parts list for each product.
5. Copy of final approved hardware schedule, edited to reflect "As installed".

B. Maintenance materials as specified.**1.7 QUALITY ASSURANCE****A. Operator Device Supplier Qualifications:** Firm specializing in the supply and servicing of institutional and commercial low energy operator devices and sliding automatic doors; accredited by manufacturers; and having a minimum of 3 years documented experience. Hardware supplier to furnish list of at least 10 completed projects complete with date completed, project location and project contact information.**B. Manufacturer Qualifications and Documentation:**

1. Operator Device Manufacturer Qualifications: Manufacturer specializing in manufacturing institutional and commercial high and low energy operator devices with a minimum 5 years with the following documented experience. Furnish list of at least 10 projects (past, finished projects). Include date completed, project location and references (past project contact information to determine if commercial high and low energy operator devices are acceptable).
2. Manufactured devices submitted must have a factory certified central dispatch service for warranty. System to be available 24 hours a day, 365 days per year to obtain malfunction information and dispatch appropriate service agency to the customer location.

C. Installer Qualifications and Documentation:

1. Company specializing in installing the products specified in this Section shall have

- minimum ten years experience and be a member of the American Association of Automatic Door Manufacturers (AAADM). A completed AAADM compliance form shall be submitted as proof of compliance with current ANSI/BHMA 156.19 American National Standard for power high and low energy operated doors as well as high energy operators. Doors shall be inspected and form shall be signed by an AAADM certified inspector prior to placing doors in operation.
2. Operator Device Installer qualifications: The installer of assembly shall be trained in the trade of installing and start-up of commercial high or low energy operator devices and sliding automatic doors. Supplier and Installer of door assemblies shall be authorized representative of manufacturers and have minimum of 5 years successful experience in detailing, supplying and installing commercial high and low energy operator devices and sliding automatic doors specified on projects of similar size, complexity and type to this Project.
 3. Local certified distributor to install operator in accordance with current ANSI/BHMA 156.19 American National Standard for High and Low Energy Power Operated Doors and local applicable codes. For low energy applications, local certified distributor to install operator in accordance with ANSI 156.19, ANSI 117.1, NFPA 101 and local applicable codes.
- D. Pre-Installation Meetings.
1. Conduct pre-installation meeting in accordance with Section 01 30 00 **[Division 01]**.
 2. Convene pre-installation meeting at least two week prior to commencing work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the requirements specified in Division 01 (see above for related sections).
- B. Deliver hardware to factory, shop, or mill of subcontractors and manufacturers requiring it or directly to the Project site as required.
- C. Each article of hardware shall be individually packaged in manufacturer's original container, properly marked or labeled in conformity with the reviewed Hardware Schedule.

1.9 WARRANTY

- A. Comply with provisions of Architect's Division 01 (see above for related sections)

1.10 MAINTENANCE MATERIALS

- A. Provide special wrenches and tools applicable to each different or special component.
- B. Provide maintenance tools and accessories supplied by manufacturer.
- C. Maintenance Data: Submit two copies of operator maintenance manuals that include the following items:
 1. Lubrication instructions.
 2. Operator maintenance instructions.
 3. Capability of servicing by local firm. List name, address and phone number of firm.

AUTOMATIC DOOR OPERATORS

PART 2 - PRODUCTS**2.1 RECYCLED CONTENT:**

- A. Provide products with at least the following content:
 - 1. Mortise Locks: 52% post-consumer recycled content
 - 2. Closers: 50% post-consumer recycled content
 - 3. Exit Devices: 50% post-consumer recycled content
 - 4. Steel Hinges: 35% pre-consumer recycled content
 - 5. Steel Kick Plates: 35% pre-consumer recycled content

2.2 MATERIALS: GENERAL REQUIREMENTS

- A. The Specifications are intended to cover all doors in the Project and establish a type and standard of quality, but it is the responsibility of the Contractor to furnish proper hardware for all openings and for a complete installation. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements (provide all devices whether specified or not in hardware sets/groups).
- B. If there are omissions in Specifications and hardware groups required for a complete installation, it shall be called to the attention of the University's Representative when the Hardware Schedule is submitted.

2.3 SUBSTITUTIONS

- A. Products referenced by specific brand names and model numbers have been identified by Owner to match other products in use either completed or in the course of completion no substitutions permitted per Public Contract Code Section 3400;
 - 1. Otherwise refer to Architect's Division 01 for substitutions (see above for related sections).

2.4 COMBINE SPECIFICATIONS & HARDWARE GROUPS/SETS IN PART 3

- A. Where hardware groups/sets have different information refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device (provide all products and services in specifications even if not written in hardware groups/sets in PART 3):

2.5 CONCEALED & SURFACE LOW ENERGY AUTOMATIC OPERATORS

- A. Acceptable Products and Manufacturers:
 - 1. TBD

2.6 CONCEALED & SURFACE LOW ENERGY AUTOMATIC OPERATORS

- A. Acceptable Products and Manufacturers:
 - 1. LCN Sr. Swing 9560 or 2850 Series (as scheduled):
 - a. Provide LCN "Reduced Force" (RF) feature
 - b. Provide LCN "Power Boost" feature to provide additional latching force (standard

- closing auto operators are not permitted).
- c. Provide LCN Independent Pair, devices in one enclosed housing unit spanning the full width of the door opening.
- B. Products by the following manufacturers will be considered for approval providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents and intended operation:
- 1. Horton 4000LE
 - 2. ED700 Series by Dorma Manufacturing
 - 3. Stanley Magic
- C. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements:
- 1. Provide required relays & devices as part of the overall system in accordance system requirements. Units shall have relay contact for interfacing products. Door operator shall have input line rating of 120VAC. unit shall have an internal circuit breaker switch to interrupt input power for servicing. Unit shall be U.L. Listed for automatic closing door. Unit shall be in compliance with the requirements of the Americans with disabilities act (ADA) and ANSI standards a117.1 and A156.19.
 - 2. Provide complete with drop plates, brackets, or adapters for arms as required to suit conditions.
 - 3. Provide adjustment for opening, closing, and checking speeds, as well as length of time door remains open. Provide units that can be utilized as a hold open devices (door placed in opened position when device three-way switch is engaged to "hold open" position).
 - 4. Provide Automatic Operators with external "On/Off/Hold-Open three-way switch" as part of overall/complete system:
 - a. Low energy operator manufacturer to have hold open toggle as part of overall system and installed on auto operator external body above frame (door placed in opened position when toggle three-way switch is engaged to "hold open" position (On/Off/Hold Open)).
 - b. Where pairs of doors have two separate Automatic Operators provide one external On/Off/Hold-Open three-way switch to operate both doors/operators.
 - 5. Fire, Life & Safety (FLS) systems coordination/description of operation: during fire alarm activation or loss of building power auto operator devices at fire rated doors to automatically close doors (coordinate integration with fire alarm system and local power system). Wiring by Divisions 26 and 28.
 - 6. Safety Sensor Devices:
 - a. At low energy operators provide OPTEX OA-603BL sensor devices (Pro-Swing Premier) by #OPTEX as scheduled, or equal. Safety sensor devices to be installed above door or above rated frame as shown.
 - 1) Safety sensor devices are not to be utilized for opening sensors (opening actuation by wall mounted push plates or separate infrared presence sensor as scheduled).
 - 2) Sensor devices are to be active infrared presence/safety sensor. The function of device is to protect the door from closing on a person or object that is standing in the swing-area detection zone. The device is to prevent a closed door from opening if a person or object is standing in the swing area zone. Devices are to prevent a door from closing on a person or object that is standing in the swing area zone while in the fully open position.

AUTOMATIC DOOR OPERATORS

- 3) On double door/simultaneous pair openings with door leafs larger than 44" provide two OA-603BL devices at each door leaf to provide minimum protection under ANSI 156.10.
- 4) Provide additional lockout module devices as required as some of the newer auto operator device manufacturers have a built in lockout (provide a fully functional system to meet design intent). Lockout module is typically determined by the door controller/control box)
- 5) Safety sensor devices to be installed as shown:

7. Relays, timer, and logic modules Devices:

- a. At all auto door operators locations, provide BEA device # BR3 relay, timer, and logic modules (required for interface to indicated security components; and shall be assembled, connected, and fully contained within the power supply enclosure).

D. Push Plates & Touch-Activated Automatic Door Controls:

1. Provide Automatic Operators devices with external Actuators. Card readers also to be utilized at exterior doors where indicated in drawings and as scheduled. Push-and-Go type features are not acceptable.
2. Acceptable Manufacturers: Wikk Industries, Inc., Greendale, WI, 877-421-9490, or equal.
3. Products:
 - a. Bar Actuator: Wikk Touch-Activated "INGRESS'R" device as scheduled, or equal.
 - b. Bollard Mounting: see hardware group/sets
4. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements:
 - a. Provide all touch-activated automatic door controls in stainless steel (Type 304) finishes with international symbol of accessibility and lettering "push to open" engraved and applied in permanent blue enamel.
 - b. Mounting: flush-type compatible with touch-activated automatic door controls. Provide complete installation brackets or adapters for automatic operator actuators to suit application.
 - c. At each location where single-type push plate devices are provided (rather than "INGRESS'R) provide two push plates; the centerline of one push plate shall be 7 inches minimum and 8 inches maximum above the floor or ground surface and the centerline of the second push plate shall be 30 inches minimum and 44 inches maximum above the floor or ground surface. Each push plate shall display the international symbol of accessibility complying with CBC.
 - d. Provide weather resistant devices with no gaps for water or ice to penetrate.
 - e. Micro-Switch to be single-pole, double-throw, dry-contact, momentary-action micro-switch.

2.7 POWER SUPPLIES

- A. Where Hardware Groups/Sets have different information (number of wires and missing power supply devices and information) refer to the following for clarification and submit according to complete and intended electrified system.
 1. Coordinate use of power supplies with door and frame locations. Provide power supplies, relays and battery backup units as part of the overall system in accordance with the manufacturer's warranty and system requirements.
 2. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to indicated security components; and shall be assembled,

connected, and fully contained within the power supply enclosure.

3. Provide required connections to fire alarm/life safety system and for remote site activation of all electrified components and functions.

2.8 FASTENINGS

- A. Fastenings shall match hardware material and finish.
- B. Use screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate size, length, type, head, metal and finish as necessary for proper match and application of hardware. Machine screws and tamping shields for attaching hardware to concrete, stone, or masonry.
- C. Provide nonferrous or corrosion-resistant steel fasteners exposed to weather.

2.9 FINISHES

- A. BHMA Finish Codes:
 1. BHMA 626 – Satin chromium plated brass or bronze.
 2. BHMA 628 – Satin or dull aluminum, clear anodized (uncoated).
 3. BHMA 630 – Satin stainless steel.
 4. BHMA 652 – Satin or dull chromium plated steel.
 5. BHMA 689 – Sprayed aluminum paint finish.
- B. Finishes: Unless otherwise specified, finishes shall be as follows:
 1. Exposed items, unless otherwise specified or scheduled: satin stainless steel 630 (US32D). Satin chrome 626 (US26D).
 2. Thresholds: Mill finish.
 3. Closers: Factory-painted finish to match adjacent hardware finish, unless specified or scheduled otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The operator installer shall examine the areas and conditions under which the automatic operators are to be installed, and notify the Design Professional in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.
- B. Measurements: Verify all dimensions by taking field measurements before any material is fabricated and shipped to the job site.

3.2 INSTALLATION

- A. Install all devices in accordance with manufacturer's printed instructions and approved shop drawings. Install all devices level and plumb.
- B. Projecting Items: Install or re-install wrappings furnished by the manufacturer.

AUTOMATIC DOOR OPERATORS

- C. Coordinate operator installation with electrical connection requirements.
- D. Sealants: Furnish and install all sealants indicated or required to complete installation per Division 07.
- E. Install equipment per current ANSI/BHMA A156.19 American National Standard for Power Assist and Low Energy Power Operated Doors and as directed by American Association of Automatic Door Manufacturers (AAADM) recommendations.
- F. Push plates & touch-activated automatic door controls:
 - 1. Install touch-activated automatic door controls at mounting height 3 inches above finished floor or as indicated on the Drawings.
 - 2. Mount touch-activated automatic door controls securely in place to supports with fasteners supplied by manufacturer.

3.3 TESTING, ADJUSTING & INSPECTION

- A. Repair or replace installations which do not perform according to manufacturer's printed instructions and approved shop drawings.
- B. Adjust parts for smooth, uniform operation. Lubricate moving parts with manufacturer recommended lubricant. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.
- C. Adjust door closer devices (inner unit within Auto Operator devices):
 - 1. Adjust closer operating effort to conform to CBC.
 - a. Interior and Exterior Doors: Not to exceed 5.0 pounds force.
 - b. When fire doors are required, the maximum effort to operate the door may be increased to the minimum allowed by the appropriate administrative authority, not to exceed 15 pounds opening force.
 - 2. Adjust closer delay and operating speeds to comply with requirements of CBC and Chapter 11B, Part 2, Title 24 CCR and the Americans with Disabilities Act Architectural Guidelines, Article 4.13.10.
 - 3. Door closers shall have sweep period adjusted so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3" from the strike. CBC.

3.4 CLEANING

- A. After repeated operation of completed installation, readjust door operators and controls for smooth, quiet and optimum operating condition and safety. Clean surfaces promptly after installation. Provide protective treatment and other precautions required through the remainder of the construction period to ensure that automatic operators will be without damage or deterioration.
- B. Defective Work: Remove and replace any defective work that cannot be properly repaired, cleaned or touched up.
- C. Just prior to final acceptance of building or as directed, remove protective paper coverings and clean and polish hardware.

3.5 HARDWARE GROUP/SETS

A. Manufacturers Legend:

<u>Code</u>	<u>Name</u>
HO	Horton Manufacturing
BE	BEA Manufacturing
LC	LCN Manufacturing
OP	Optex Manufacturing
WI	Wikk Manufacturing

B. Hardware Columns - Example (Legend):

<u>Qty</u>	<u>Device Description</u>	<u>Device #</u> (include specification language)	<u>Finish</u>	<u>Manu</u>
1	-----	-----	--	--

- C. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section (see above section and related sections including Division 01).
1. Examine Contract Documents and furnish proper hardware for door openings.
 2. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.

Hardware Group/Set # 01

In addition to the devices specified in hardware group/set no. 01 within 08 71 00 "Door Hardware", coordinate, furnish & install the following devices:					
2	Ea.	Concealed Overhead Low Energy Operator System	Sr. Swing 2850 x Reduced Force (concealed Push-Side Application) x Offset Pivots	689	LC
2	Ea.	Offset or Special Application Arm	Furnish & install Operator arm(s) as required for door & frame application		LC
2	Ea.	Special Application, Operator Installation / Mounting Plates	Furnish & install Operator Installation / Mounting devices as required for door & frame application		LC
1	Ea.	In-ground Exterior Bollard x Touch-Activated Automatic Door Control (Operator System Actuators also known as Push-Plate devices)	Provide custom #BPR (round) bollard x IG (in ground) x height per architectural drawings x flat top x card reader prep & raindrip cover x SS#4 stainless steel bollard x flat mounted INGRESS'R #I36-5 (hardwired, stainless steel with blue wheelchair logo & added text "PUSH TO OPEN" x special layout wording).	630	WI
1	Ea.	Interior Touch-Activated Automatic Door Control (Single Unit)	INGRESS'R #I36-5 (hardwired stainless steel with blue wheelchair logo & added text "PUSH TO OPEN" x special layout wording) installed flush to wall per architectural plans.	630	WI
1	Ea.	Safety Sensor	Optex #OA-603BL x required installation brackets		OP
1	Ea.	Relay Devices by Auto Operator (as required or similar pre-approved relay for interface tasks)	Furnish & install BEA #BR3, #10-BR3 or approved equal relay device: 087113 task to interface all inputs and outputs on the power supply (interfaces to all applicable devices)		BE
2	Ea.	Three-Way Switch (On/off/hold-open)	Per specifications		LC
1	Ea.	Various Inputs & Outputs Interface Task (required connectivity & required wires/devices per Operator device manufacturer's recommendations)	087113 interface of all inputs & outputs (including but not limited to electric latch retraction or locking device power supplies & BR3-type devices to all other inputs & output devices)		
1	Ea.	Card Reader Device(s) & Access Control (including but not limited to wire & connectivity from ceiling through frame to electrified hinge or EPT then length of wire inside the door) = By security (coordinate with divisions 25-28 & applicable plans)			
NOTE 1: Description Of Operation (Auto Operator): When actuator switches are depressed or a "valid" card reader is used the auto opening cycle will be initiated. The opening cycle will provide power and opens the door to the hold open position. The door can be held open for up to 30 Seconds before the closing cycle starts. Free egress at all times by depressing panic, exit device bar. Upon power failure the low energy operator acts as a standard closer in the event of the loss of power or when exiting or entering manually.					
NOTE 2: In addition to coordination with wall, framing and door system, coordinate balance of hardware supplied by section 08 7100 "Door Hardware" for additional hardware and door application requirements (devices can include but are not limited to standard pivot point hinging device applications; electrified power transfer devices; electrified latch retraction devices; electrified latch retraction power supplies; door position switches & request-to-exit devices). Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in 08 71 00 language above, architectural plans & full specification documents).					

- END OF SECTION -

- SECTION 08 8000 -

INTERIOR GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Types of work in this Section include glass and glazing for:
 - a. Float Glass
 - b. Tempered Glass
 - c. Insulated Units
 - d. Fire Protective Rated Safety Glass
 - e. Decorative Laminated Glass
 - f. Decorative Film Overlay

1.3 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.4 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 7300 "Decorative Metal and Glass Railings" for Monumental stair railing and guardrail system requiring tempered glass panels supplied under and in accordance with 05 7300.
- C. Section 07 9200 "Joint Sealants"
- D. Section 08 1113 "Hollow Metal Doors and Frames"
- E. Section 08 1400.01 "Wood Doors" (Courtyard)
- F. Section 08 1400.02 "Wood Doors" (Residence Inn)

- G. Section 08 4114 "Interior Aluminum Framed Entrances and Storefronts"
- H. Section 08 4229 "Automatic Entrance Doors"
- I. Section 08 8013 "Exterior Glazing"
- J. Section 08 8300 "Mirrors" for unframed mirrors
- K. Section 10 2800.01 "Toilet, Bath, and Laundry Accessories" (COURTYARD) for framed mirrors
- L. Section 10 2800.02 "Toilet, Bath, and Laundry Accessories" (RESIDENCE INN) for framed mirrors

1.5 REFERENCES

- A. [American Architectural Manufacturers Association \(AAMA\)](#) Publications:
 - 1. 800-92 "Voluntary Specifications and Test Methods for Sealants"
- B. [American National Standards Institute \(ANSI\)](#) Publications:
 - 1. ANSI/AAMA 101 "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors"
- C. [ASTM International \(ASTM\)](#) Publications:
 - 1. C920 "Standard Specification for Elastomeric Joint Sealants"
 - 2. C1036 "Standard Specification for Flat Glass"
 - 3. C1048 "Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass"
 - 4. C1172 "Standard Specification for Laminated Architectural Flat Glass"
 - 5. C1376 "Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass"
 - 6. E774 "Standard Specification for Sealed Insulating Glass Units"
 - 7. E1300 "Standard Practice for Determining Load Resistance of Glass in Buildings"
- D. [Consumer Product Safety Commission \(CPSC\)](#) Publications:
 - 1. 16 [CFR](#) 1201 - "Safety Standard for Architectural Glazing Materials"
- E. [Glass Association of North America \(GANA\)](#)
 - 1. "GANA Glazing Manual"
 - 2. "FGMA Sealant Manual"
- F. [Insulating Glass Manufacturers Alliance \(IGMA\)](#) Publications:
 - 1. SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units"
- G. [National Fenestration Rating Council \(NFRC\)](#)
- H. [National Glass Association \(NGA\)](#)
 - 1. Glazier Certification Program
- I. [Underwriter's Laboratories, Inc. \(UL\)](#) Standards:
 - 1. 10C "Positive Pressure Fire Tests of Door Assemblies"

1.6 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.
 - 1. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.
 - 2. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.
- C. Samples: Submit, for verification purposes, 12" square samples of each type of glass indicated except for clear single pane units, and 12" long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color. Sample requirement may be waived by Owner's Representative at their discretion.

1.7 QUALITY ASSURANCE

- A. Glazing Standards: Comply with recommendations of the [Glass Association of North America \(GANA\)](#) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- C. Safety Glazing Products: Comply with testing requirements in 16 [CFR](#) 1201.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the [Safety Glazing Certification Council \(SGCC\)](#) or another certification agency acceptable to authorities having jurisdiction.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. [IGMA](#) Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- E. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.9 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.10 WARRANTY

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. All material shall be free from manufacturer defects and installation workmanship. Any material or workmanship judged to be defective shall be replaced at no cost to the Owner.
- C. Insulating glass units shall be jointly guaranteed for a period of ten (10) years by the manufacturer and installer against obstruction of vision between interior glass surfaces caused by failure of the hermetic seal. Units damaged during guarantee period shall be replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE GLASS MANUFACTURERS

- A. All glass shall be new material, graded under [ASTM](#) 1036.
- B. All glass in related area shall be from one manufacturer.
- C. As indicated on Drawings.

2.2 GLASS MATERIALS

- A. Refer to Drawings for location of glass.
- B. Refer to Drawings for additional glass types and manufacturers.
 - 1. Refer also to Finish Specifications Drawing.
- C. Glass [\[I\]](#): Clear Float Glass: [ASTM](#) C1036, Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), as manufactured by one of the following:
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:

- a. [PPG Industries](#) (800-377-5267)
- b. [Pilkington North America](#) (800-221-0444)
- c. [AGC Flat Glass North America](#) (800-251-0441)
- d. [Guardian Industries](#) (248-340-1800)

D. Glass [II]: Tempered Glass: **1/4 -inch**, Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3, clear, fully tempered safety glass.

- 1. All tempered glass shall conform to [ASTM](#) C1048, and Federal Standard [CPSC](#) 16 [CFR](#) 1201. Tempered glass shall bear permanent monogram indicating tempered quality. Fabrication marks on tempered glass shall be located to be concealed in completed installation.
- 2. Color: Clear to match aluminum windows glazing, Section 08520 (08 51 13).
- 3. Approved Manufacturers:
 - a. [PPG Industries](#) (800-377-5267)
 - b. [Pilkington North America](#) (800-221-0444)
 - c. [AGC Flat Glass North America](#) (800-251-0441)
 - d. [Guardian Industries](#) (248-340-1800)

E. Glass Type "**G-5**": (Vision) Insulating Glass Unit (**HEAT STRENGTHENED**): Sealed insulating glass assembly.

- 1. Basis-of-Design Product: "**Clear Glass** (no tint)" with "Solarban 67® (2) Clear + Clear, Solar Control (Sputtered) Low-E" Glass by PPG.
 - a. Overall Unit Thickness: **1-inch (25 mm)**.
 - b. Outdoor Lite: Clear, Class 1 (Clear) float glass, **1/4 -inch (6 mm)**.
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
 - 2) Low-E Coating: Sputtered on second surface.
 - c. Interspace Content: Sealed hermetic air with **1/2 -inch (12 mm)** continuous perimeter warm edge spacer bar with integral **40 percent** desiccant.
 - d. Secondary seal of two part structural silicone.
 - e. Indoor Lite: Class 1 (clear) float glass, **1/4 -inch (6 mm)**.
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
- 2. Specifications:
 - a. Transmittance: (Optical Performance)
 - 1) UV: 11% Ultraviolet
 - 2) VLT: 54% Visible Light Transmittance
 - 3) TSE: 24% Total Solar Energy
 - b. Reflectance:
 - 1) Interior Visible: 16%
 - 2) Exterior Visible: 19%
 - 3) TSE: 34% Total Solar Energy
 - c. Performance:

- 1) Winter night time U-Value: 0.29
- 2) Summer day time U-Value: 0.27
- 3) SC: 0.33 Shading Coefficient
- 4) SHGC: 0.29 Solar Heat Gain Coefficient
- 5) LSG: 1.86 Light to Solar Gain ratio
- d. Acoustical Performance:
 - 1) STC: 32, minimum, refer to Sections;
 - a) 08 4114 "Interior Aluminum-Framed Entrances and Storefronts"

2.3 FIRE-PROTECTIVE GLAZING PRODUCTS

- A. Fire-Protective, Ceramic Glazing Material: Proprietary product in the form of two plies of laminated clear ceramic flat sheets, permanently labeled with appropriate marks of testing and inspecting agency, acceptable to authorities having jurisdiction, showing product complies with fire-protective installation indicated, and as follows:
1. Safety Glass: Shall conform to [ASTM C1048](#), and Federal Standard [CPSC 16 CFR 1201](#).
 2. Polished on both surfaces, transparent with minimum visible light transmission of 85 percent.
 3. Positive Pressure: Shall meet requirements of positive pressure test standards UL 10C.
 4. NFPA 252 for Door Assemblies.
 5. NFPA 257 for Window Assemblies.
 6. Manufacturers:
 - a. Avendra, LLC Preferred Manufacturers:
 - 1) None
 - b. Approved Manufacturers:
 - 1) 5/16" thick, "Premium FireLite Plus" distributed by [Technical Glass Products](#) (800-426-0279).
 - 2) 5/16" thick, "SGG Keralite FR-L"; [Vetrotech Saint-Gobain](#) (888-803-9533)
 - 3) 5/16" thick, "PYRAN Star L"; [Schott North America, Inc.](#) (800-657-4439)
 - 4) 5/16" thick, "PYRAN Platinum L"; [Schott North America, Inc.](#) (800-657-4439)
- B. Fire-Protective, Filmed Glazing Material: Proprietary product in the form of one ply of clear ceramic flat sheet with clear safety film, permanently labeled with appropriate marks of testing and inspecting agency, acceptable to authorities having jurisdiction, showing product complies with fire-protective installation indicated, and as follows:
1. Safety Glass: Shall conform to [ASTM C1048](#), and Federal Standard [CPSC 16 CFR 1201](#).
 2. Polished on both surfaces, transparent with minimum visible light transmission of 85 percent.
 3. Positive Pressure: Shall meet requirements of positive pressure test standards [UL 10C](#).
 4. [NFPA 252](#) for Door Assemblies.
 5. [NFPA 257](#) for Window Assemblies.
 6. Manufacturers:
 - a. Avendra, LLC Preferred Manufacturers:
 - 1) None

b. Approved Manufacturers:

- 1) **3/16 -inch** thick, "Superlite C/SP"; [SAFTI First](#) (800-653-3333)
- 2) **3/16 -inch** thick, "FireLite NT" distributed by [Technical Glass Products](#) (800-426-0279).
- 3) **3/16 -inch** thick, "SGG Keralite FR-F"; [Vetrotech Saint-Gobain](#) (888-803-9533)
- 4) **3/16 -inch** thick, "PYRAN Star F"; [Schott North America, Inc.](#) (800-657-4439)
- 5) **3/16 -inch** thick, "PYRAN Platinum F"; [Schott North America, Inc.](#) (800-657-4439)

2.4 DECORATIVE FILM OVERLAY (COURTYARD)

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. [Avery Dennison Graphics and Reflective Products Division](#) (502-637-5079)

C. Color and Pattern: Refer to Interior Finish Index

2.5 MIRRORS

A. Refer to Section 08 8300 "Mirrors"

2.6 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with [ASTM](#) C920 requirements, including those for Type, Grade, Class and Uses.
4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Owner's Representative from manufacturer's standard colors.

B. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with [AAMA](#) A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

C. Sealants: Provide structural and weatherseal sealants recommended by the manufacturer of the glazing system.

1. As manufactured by the following:
 - a. [GE Silicones](#) (800-255-8886)
 - b. [Tremco, Inc., Sealant/Weatherproofing Division, an RPM Company](#) (800-562-2728)
 2. Refer to Section 07 9200 for requirements.
- D. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Provide the curtain wall manufacturer's permanent nonmigrating types compatible with sealants and suitable for joint movement and sealing requirements.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
- D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
- E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
- F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

INTERIOR GLAZING

3.3 GLAZING - GENERAL

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- D. Anchor components securely in place in the manner indicated. Shim and allow for movement resulting from changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and "freeze-up" of moving joints.
- E. Glazing: Inspect glass and framing for compliance with manufacturing and installation tolerances, including size, squareness, and offsets at corners; for existence of minimum face or edge clearances; and for effective sealing of joinery.
 - 1. Avoid point loading of glass. Do not proceed with glazing work until unsatisfactory conditions have been corrected. Do not field-cut glass.
 - 2. Field-Glazed Structural Silicone Glazing Work: Clean frames and glass surfaces with an approved solvent. Prime surfaces and apply structural sealant in accordance with manufacturer's recommendations. Clean excess structural sealant before curing. Mechanically hold glass firmly in place until sealant is sufficiently cured. Install compressible backer rods in joint before applying weatherseal sealant.
- F. Erection Tolerances: Install curtain wall components plumb, level, accurately aligned, and located in reference to column lines and floor levels. Erection tolerances indicated below are the maximum allowable for both no-load and full-load conditions and are not cumulative. Adjust work to conform to the following tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment: Limit offset of member alignment to 1/16 inch where surfaces are flush or less than 1/2 inch out of flush and separated by less than 3 inches by protruding work; otherwise limit offsets to 1/8 inch.
 - 4. Location: 3/8 inch maximum deviation from the measured theoretical location of any member at any location.

3.4 GLAZING - INSTALLATION

- A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

- B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- D. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

3.5 DECORATIVE FILM OVERLAY - INSTALLATION

- A. Preparation: Clean glass in accordance with manufacturer's recommendations.
- B. Apply to glass in accordance with manufacturer's recommendations. Installation shall be squarely aligned to glass edges and free of air bubbles, tears, wrinkles, and rough edges.

3.6 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.
- D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- E. Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion.

- END OF SECTION -

- SECTION 08 8013 -**EXTERIOR GLAZING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Types of work in this Section include glass and glazing for Exterior Openings:
 - a. Heat strengthened typical, unless required to be Tempered
 - b. Float Glass
 - c. Safety Glass
 - d. Insulated Units
 - e. Laminated glazing
 - 2. Curtain Walls
 - 3. Windows
 - 4. Storefronts
 - 5. Entrances
 - 6. Metal Doors
 - 7. Skylights

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Pertinent sections of Division 08 specifying doors, windows, curtainwalls and storefront requiring glazing.
- D. Pertinent sections of Division 08 specifying interior glazing.
- E. Pertinent sections of Division 10 Sections specifying exterior canopies with laminated horizontal glass covers.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Architectural Manufacturers Association (AAMA) Publications:
 - 1. 800-92 "Voluntary Specifications and Test Methods for Sealants"
- C. American National Standards Institute (ANSI) Publications:
 - 1. ANSI/AAMA 101 "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors"
- D. ASTM International (ASTM) Publications:
 - 1. C920 "Standard Specification for Elastomeric Joint Sealants"
 - 2. C1036 "Standard Specification for Flat Glass"
 - 3. C1048 "Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass"
 - 4. C1172 "Standard Specification for Laminated Architectural Flat Glass"
 - 5. C1376 "Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass"
 - 6. E774 "Standard Specification for Sealed Insulating Glass Units"
 - 7. E1300 "Standard Practice for Determining Load Resistance of Glass in Buildings"
- E. Consumer Product Safety Commission (CPSC) Publications:
 - 1. 16 CFR 1201 - "Safety Standard for Architectural Glazing Materials"
- F. Glass Association of North America (GANA)
 - 1. "GANA Glazing Manual"
 - 2. "FGMA Sealant Manual"
- G. Insulating Glass Manufacturers Alliance (IGMA) Publications:
 - 1. SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units"
- H. National Glass Association (NGA)
 - 1. Glazier Certification Program

1.5 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for

maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- G. Glazing Units Surfaces:
 - 1. Insulated units:
 - a. Side 1 - Exterior surface of outer pane.
 - b. Side 2 - Interior surface of outer pane.
 - c. Side 3 - Interior surface of inner pane.
 - d. Side 4 - Exterior surface of inner pane
 - 2. Laminated units:
 - a. Side 1 - Top surface of top outer pane in horizontal orientation.
 - b. Interlayer: PVB material between two pieces of monolithic glass
 - c. Side 2 - Underside of bottom outer pane in horizontal orientation.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions. Demonstrate compliance with specified attributes.
- B. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- C. Samples: Submit, for verification purposes, 12 -inch square samples of each type of glass indicated except for clear single pane units, and 12 -inch samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color. Sample requirement may be waived by Owner's Representative at their discretion.
- D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Informational Submittals:

1. Qualification Data: For Installer manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency, and sealant testing agency.
2. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - a. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
3. Product Test Reports: For each of the following types of glazing products:
 - a. Tinted float glass
 - b. Coated float glass
 - c. Insulating glass units
 - d. Laminated glass units
 - e. Safety glazing
 - f. Door lite glazing
 - g. Glazing sealants
 - h. Glazing gaskets
4. Preconstruction Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.
5. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 .

1. Provide safety glazing products permanently marked with certification label of the Safety Glazing Certification Council (SGCC) or another certification agency acceptable to authorities having jurisdiction.
 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
1. Insulating Glass Certification Council.
 2. Associated Laboratories, Inc.
- G. Source Limitations for Glass: Provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.
- H. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.9 AMBIENT CONDITIONS

- A. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.
1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. All material shall be free from manufacturer defects and installation workmanship. Any material or workmanship judged to be defective shall be replaced at no cost to the Owner.
- C. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- D. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.
- E. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- D. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

- a. Specified Design Wind Loads: As indicated on structural drawings, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
 - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 3 seconds.
 - c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 -inch (25 mm), whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
 - 3) For laminated-glass lites.
 - d. Minimum Glass Thickness for Exterior Lites:
 - 1) Typical: Not less than 1/4 -inch (6.0 mm).
 - 2) Laminated Glass: In accordance with design, refer to Glazing Schedule as herein specified
 - e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- E. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- F. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 1/4 -inch (6.0 mm) thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

2.2 ACCEPTABLE GLASS MANUFACTURERS AND FABRICATORS

- A. Acceptable Glass Manufacturers:
1. PPG Industries, www.ppg.com (800-377-5267)
 2. Pilkington North America, www.pilkington.com (800-221-0444)
 3. AGC Flat Glass North America, www.agc.com (800-251-0441)
 4. Guardian Industries, www.guardian.com (248-340-1800)

- B. Acceptable Glass Fabricators:
1. Manufacturers listed above
 2. Northwestern Industries, www.nwiglass.com
 3. Oldcastle Building Envelope, www.oldcastle.com
 4. Viracon, www.viracon.com

2.3 GLASS MATERIALS

- A. Refer to Drawings for location of glass types.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 3. For uncoated glass, comply with requirements for Condition A.
 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where indicated for use as safety glass.
- C. Tempered Glass: Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3, Kind FT (fully tempered), safety glass.
1. All tempered glass shall conform ASTM C1048, and Federal Standard CPSC 16 CFR 1201. Tempered glass shall bear permanent monogram indicating tempered quality. Fabrication marks on tempered glass shall be located to be concealed in completed installation.
 2. Color: Match related windows glazing.
- D. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.
1. Low E Coating: Side 2 on insulated units.
 2. Approved Manufacturers and products:
 - a. "Solarban 60® Solar Control Low-E" Glass by [PPG Industries](http://www.ppg.com) (800-377-5267)
- E. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, Heat-strengthened and complying with other requirements specified. (Tempered where indicated or required to meet code requirements)
1. Basis-of-Design Product: Subject to compliance with requirements, provide ceramic-coated spandrel glass by Acceptable Glass Fabricators listed above.
 2. Glass: As indicated in scheduled assembly, clear float otherwise.
 3. Ceramic Coating Color: As selected by Architect to match his sample.
- F. Laminated Glass: ASTM C 1172, and complying with other requirements specified and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other

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requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation and with the following:

1. Construction: Laminated glass with PVB interlayer to comply with interlayer manufacturer's written recommendations and assembly design.
 2. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
 - b. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements and assembly design.
 - c. Interlayer Color: Clear unless otherwise indicated.
 3. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.
- G. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in "Insulating-Glass Units" Article.
1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article.
 2. Provide Kind FT (fully tempered) glass lites or laminated glass as indicated where safety glass is required or scheduled.
 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 4. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Manufacturer's standard sealants.
 - b. Desiccant: Manufacturer's Standard, Molecular Sieve, Silica Gel or Blend of Both.
 5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Manufacturer's Standard Metal Warm Edge; aluminum with mill or clear, or colored anodic finish as selected by Architect.
 - 1) Stainless steel if required based on size of unit.

2.4 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

- A. General: Provide products of type indicated and complying with the following requirements:
1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
 3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Owner's Representative from manufacturer's standard colors.
 5. VOC Compliance: Meet VOC requirements specified in related section and as required by local jurisdiction.
- B. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.
- C. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral-Curing Silicone Glazing Sealants GS-1:
 - a. Available Products:
 - 1) GE Silicones; SilPruf SCS2000.
 - 2) Pecora Corporation; 864.
 - 3) Pecora Corporation; 890.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1) Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel and wood.
 - f. Applications: Vertical glazing applications as recommended by manufacturer where wet seal is preferred over gaskets.
- D. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Provide the curtain wall manufacturer's permanent nonmigrating types compatible with sealants and suitable for joint movement and sealing requirements.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer, meeting requirements of VOC limits specified in related sections.
- C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
- D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

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- E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
- F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Butt-glazed Monolithic Lites: Clean-cut or flat-grind vertical edges in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish glass edges and corners, where exposed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Obtain installers written report listing conditions detrimental to performance of glazing work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.3 GLAZING, GENERAL

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

- C. Protect glass from edge damage during handling and installation:
 - 1. Use a rolling block in rotating glass units to prevent damage to glass corners.
 - 2. Do not impact glass with metal framing.
 - 3. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar.
 - 4. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening.
 - 5. Discard glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Anchor components securely in place in the manner indicated. Shim and allow for movement resulting from changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and "freeze-up" of moving joints.
- F. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- G. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- H. Provide spacers for glass lites where length plus width is larger than 50 -inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8 -inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- I. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- J. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
 - 1. Avoid point loading of glass.
 - 2. Do not field-cut glass.
- K. Field-Glazed Structural Silicone Glazing Work: Clean frames and glass surfaces with an approved solvent. Prime surfaces and apply structural sealant in accordance with manufacturer's recommendations. Clean excess structural sealant before curing. Mechanically hold glass firmly in place until sealant is sufficiently cured. Install compressible backer rods in joint before applying weatherseal sealant.
- L. Erection Tolerances: Install curtain wall components plumb, level, accurately aligned, and located in reference to column lines and floor levels. Erection tolerances indicated below are the maximum allowable for both no-load and full-load conditions and are not cumulative. Adjust work to conform to the following tolerances:

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1. Plumb: **1/8 -inch** in **10 -feet**; **1/4 -inch** in **40 -feet**.
2. Level: **1/8 -inch** in **20 -feet**; **1/4 -inch** in **40 -feet**.
3. Alignment: Limit offset of member alignment to **1/16 -inch** where surfaces are flush or less than **1/2 -inch** out of flush and separated by less than **3 -inches** by protruding work; otherwise limit offsets to **1/8 inch**.
4. Location: **3/8 -inch** maximum deviation from the measured theoretical location of any member at any location.

3.4 SEALANT GLAZING

- A. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer.
- D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- E. Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion.

3.6 GLAZING SCHEDULE

- A. Glazing Assemblies - General: Provide safety glazing (fully tempered Type FT or laminated glazing) where required by code or design criteria. Types as indicated on drawings, if not shown, provide fully tempered safety glazing.
- B. Glass Type "**G-1**": (Vision) Insulating Glass Unit (**HEAT STRENGTHENED**): Sealed insulating glass assembly.
 1. Basis-of-Design Product: "**Tinted Glass**" with "Solarban 70XL® (2) Starphire®" + Clear, Solar Control (Sputtered) Low-E" Glass by PPG.

- a. Overall Unit Thickness: 1-inch (25 mm).
 - b. Outdoor Lite: "Starphire", Class 1 (Tinted) float glass, 1/4 -inch (6 mm).
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
 - 2) Low-E Coating: Sputtered on second surface.
 - c. Interspace Content: Sealed hermetic air with 1/2 -inch (12 mm) continuous perimeter warm edge spacer bar with integral 40 percent desiccant.
 - d. Secondary seal of two part structural silicone.
 - e. Indoor Lite: Class 1 (clear) float glass, 1/4 -inch (6 mm).
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
2. Specifications:
- a. Transmittance: (Optical Performance)
 - 1) UV: 6% Ultraviolet
 - 2) VLT: 64% Visible Light Transmittance
 - 3) TSE: 25% Total Solar Energy
 - 4) OVLT: 12% Outdoor Visible Light Transmittance
 - b. Reflectance:
 - 1) Visible: 12%
 - 2) TSE: 52% Total Solar Energy
 - c. Performance:
 - 1) Winter night time U-Value: 0.28
 - 2) Summer day time U-Value: 0.26
 - 3) SC: 0.32 Shading Coefficient
 - 4) SHGC: 0.27 Solar Heat Gain Coefficient
 - 5) LSG: 2.37 Light to Solar Gain
 - d. Acoustical Performance:
 - 1) STC: 32, minimum, refer to Sections;
 - a) 08 4113 "Aluminum-Framed Entrances and Storefronts"
 - b) 08 4413 "Glazed Aluminum Curtain Walls"
- C. Glass Type "G-2": (Vision) Insulating Glass Unit (**HEAT STRENGTHENED**): Sealed insulating glass assembly.
- 1. Basis-of-Design Product: "Clear Glass (no tint)" with "Solarban 67® (2) Clear + Clear, Solar Control (Sputtered) Low-E" Glass by PPG.
 - a. Overall Unit Thickness: 1-inch (25 mm).
 - b. Outdoor Lite: Clear, Class 1 (Clear) float glass, 1/4 -inch (6 mm).
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
 - 2) Low-E Coating: Sputtered on second surface.

- c. Interspace Content: Sealed hermetic air with 1/2 -inch (12 mm) continuous perimeter warm edge spacer bar with integral 40 percent desiccant.
- d. Secondary seal of two part structural silicone.
- e. Indoor Lite: Class 1 (clear) float glass, 1/4 -inch (6 mm).
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
- 2. Specifications:
 - a. Transmittance: (Optical Performance)
 - 1) UV: 11% Ultraviolet
 - 2) VLT: 54% Visible Light Transmittance
 - 3) TSE: 24% Total Solar Energy
 - b. Reflectance:
 - 1) Interior Visible: 16%
 - 2) Exterior Visible: 19%
 - 3) TSE: 34% Total Solar Energy
 - c. Performance:
 - 1) Winter night time U-Value: 0.29
 - 2) Summer day time U-Value: 0.27
 - 3) SC: 0.33 Shading Coefficient
 - 4) SHGC: 0.29 Solar Heat Gain Coefficient
 - 5) LSG: 1.86 Light to Solar Gain ratio
 - d. Acoustical Performance:
 - 1) STC: 32, minimum, refer to Sections;
 - a) 08 4113 "Aluminum-Framed Entrances and Storefronts"
 - b) 08 4413 "Glazed Aluminum Curtain Walls"
- D. Glass Type "G-3": Ceramic-coated, insulating Spandrel glass; **(HEAT STRENGTHENED)** sealed insulating glass assembly.
 - 1. Basis-of-Design Product: "Clear Glass (no tint)" with "Solarban 67® (2) Clear + Clear, Solar Control (Sputtered) Low-E" Glass by PPG.
 - a. Overall Unit Thickness: 1-inch (25 mm).
 - b. Outdoor Lite: Clear, Class 1 (Clear) float glass, 1/4 -inch (6 mm).
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
 - c. Interspace Content: Sealed hermetic air with 1/2 -inch (12 mm) continuous perimeter warm edge spacer bar with integral 40 percent desiccant.
 - d. Secondary seal of two part structural silicone.
 - e. Indoor Lite: Class 1 (clear) float glass, 1/4 -inch (6 mm).
 - 1) Kind HS (Heat Strengthened).
 - a) Tempered where required, refer to Drawings.
 - b) Tempered glass in compliance with Building Code
 - f. Coating

- 1) Type: Silk-screened ceramic frit
 - a) Full Ceramic Frit: Roller coated glass with solid color
 - 2) Coatings: 40 microns each coat, minimum
 - 3) Process: Ceramic Frit paint is heat fussed onto the glass surface.
 - 4) Standard: ASTM C1048, Condition B (spandrel glass, one surface ceramic coated) Type I (transparent flat glass), Quality Q3, and complying with other specified requirements.
 - 5) Color (Ceramic Frit):
 - a) Custom color to match Architect's samples
 - g. Coating Location: Third surface.
 2. Specifications:
 - a. Performance:
 - 1) Winter night time U-Value: 0.29
 - 2) Summer day time U-Value: 0.27
 - b. Acoustical Performance:
 - 1) STC: 32, minimum, refer to Sections;
 - a) 08 4113 "Aluminum-Framed Entrances and Storefronts"
 - b) 08 4413 "Glazed Aluminum Curtain Walls"
- E. Glass Type "**G-4**": Insulating Glass Unit (**TEMPERED with LAMINATED GLAZING LITE**): Sealed insulating glass assembly.
1. Application: Skylights
 2. Basis-of-Design Product: Tinted exterior lite with "Solarban 67® (2) Pacifica + Clear, Solar Control (Sputtered) Low-E" Glass by PPG.
 - a. Overall Unit Thickness: 1 1/8 -inch per Section 08 6300.
 - 1) Coordinate with manufacturer of skylight to confirm overall assembly thickness.
 - b. Outdoor Lite: Class 1 (Tinted) float glass, 1/4 -inch (6 mm) thick.
 - 1) Solarban 67, Pacifica
 - 2) Tempered.
 - 3) Low-E Coating: Sputtered on second surface.
 - 4) Coating: Pyrolytic on outside face
 - c. Air Space:
 - 1) Interspace Content: Sealed hermetic air with 1/2 -inch (12 mm) continuous perimeter warm edge spacer bar with integral 40 percent desiccant.
 - 2) Secondary seal of two part structural silicone.
 - d. Inside Lite:
 - 1) Clear on clear.
 - 2) Laminated safety glazing, 3/8 -inch thick overall.
 3. Specifications for reference (these values below represent 1/4 -inch with 1/2 -inch air space over 1/4 -inch interior lite which is similar to actual assembly for skylight) and assembly shall meet or exceed the following:
 - a. Transmittance: (Optical Performance)
 - 1) UV: 3% Ultraviolet
 - 2) VLT: 26% Visible Light Transmittance

- 3) TSE: 11% Total Solar Energy
- b. Reflectance:
 - 1) Visible: 8%
 - 2) TSE: 8% Total Solar Energy
- c. Performance:
 - 1) Winter night time U-Value: 0.29
 - 2) Summer day time U-Value: 0.27
 - 3) SC: 0.21 Shading Coefficient
 - 4) SHGC: 0.19 Solar Heat Gain Coefficient
 - 5) LSG: 1.37 Light to Solar Gain ratio

F. Glass Type "**G-5**": Interior (Vision) Insulating Glass Unit (**HEAT STRENGTHENED**): Sealed insulating glass assembly.

- 1. Refer to Section 08 8000 "Interior Glazing"

- END OF SECTION -

- SECTION 08 8300 -**MIRRORS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Unframed Mirrors
 - 1. Annealed monolithic glass:
 - a. Etched.
 - b. Polished.
 - c. Refer to Drawings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 08 8000 "Interior Glazing"
- D. Section 09 2900 "Gypsum Board"
- E. Section 10 2800.01 "Toilet, Bath, and Laundry Accessories" (COURTYARD) for framed mirrors
- F. Section 10 2800.01a "Toilet and Bath Accessory Matrix" (COURTYARD)
- G. Section 10 2800.02 "Toilet, Bath, and Laundry Accessories" (RESIDENCE INN) for framed mirrors
- H. Section 10 2800.02a "Toilet and Bath Accessory Matrix" (RESIDENCE INN)

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.

1.5 DEFINITIONS

- A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
 - 2. Mirror hardware.
 - 3. Mirror mastic.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- F. Samples: For each type of mirror product required, in the form indicated below:
 - 1. Mirrors, 12 inches (300 mm) square, including edge treatment on 2 adjoining edges.
 - 2. Mirror bottom trim, 12 inches (300 mm) long.
 - 3. Mirror top clips.
- G. Warranty: Special warranty specified in this Section.
- H. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under NGA's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.

MIRRORS

- C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.
- D. Glazing Publications: Comply with the following published recommendations:
 - 1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 - 2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.
- C. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mirrors that may be incorporated into the Work include, but are not limited to, the following:
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. [Binswanger Mirror, Division of Vitro America](#) (800-238-6057)
 - b. [Guardian Consolidated](#), (276-236-5196)
 - c. [Gardner Glass Products](#) (800-334-7267)
- B. Mirror Adhesive System:
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. Edge Seal:
 - 1) "UC-4401" - [PPG Industries Inc., Glass Group](#); (800-377-5267)
 - 2) "Seal-Kwik Edge Sealer" [Gunther Mirror Mastics, a Royal Adhesives and Sealants, LLC Company](#) (800-227-6181)
 - 3) Approved Substitution as recommended by mirror manufacturer.

2.3 SILVERED FLAT GLASS MIRROR MATERIALS

- A. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
1. Mirror glazing "select" quality float glass complying with [ASTM](#) C1036 and [CPSC](#) 16 [CFR](#) 1201, [1/4 -inch \(6.0 mm\)](#) thick.
 2. Silvering: Provide electro-deposited silvering in two coats.
- B. Clear Glass: Mirror Glazing Quality.
1. Nominal Thickness: [1/4 -inch \(6.0 mm\)](#), minimum.
 2. Exposed edges ground smooth and polished.
- C. Patterns and Colors: As indicated on the Drawings or as selected by the Architect.
- D. Mirror sizes indicated on the drawings.
1. Extend mirror to within 1" of adjacent walls, on each end, in one piece where shown to be full width, unless noted otherwise.

2.4 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

- C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gunther Mirror Mastics.
 - b. Henry.
 - c. Palmer Products Corporation.
 - d. Pecora Corporation
 2. Primers/Sealers: Types recommended by adhesive manufacturer as required.

2.5 MIRROR HARDWARE

- A. Exposed Mirror Clips:
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. Approved substitution
 - b. C.R.Laurence Co., Inc.
 - c. Knappe & Vogt
 3. Refer to drawings for mirror applications.
- B. Bottom attachment: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
1. Trim:
 - a. Mfgr: C. R. Laurence Co., Inc.;
 - b. Type: (Shall be reviewed for approval in Shop Drawings)
 - 1) L Bar extruded aluminum with front leg at 1/4 -inch and back leg at 1 -inch in height, respectively.
 - a) Model: CRL Aluminum 1/4 -inch "L-Bar" extrusion. (Unless indicated otherwise on Drawings.)
 - c. Finish: As indicated on drawings from the following options, otherwise selected by Architect from the following:
 - 1) L902A: Satin anodized aluminum
 - 2) L902BA: Brite anodized aluminum
 - 3) L902GA: Gold anodized aluminum
 - 4) L902BGA: Brite Gold anodized aluminum
 - 5) L902BN: Brushed nickel aluminum
 - 6) L902BRZ: Bronze electro-Static painted aluminum
 - 7) L902P: Polished aluminum

- C. Top attachment: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Clips:

- a. Application: For top of mirror only.
- b. Mfgr: C. R. Laurence Co., Inc.;
 - 1) **9/16 -inch** wide x **1-1/4 -inch** long; Model No. 318; Knappe & Vogt (800-253-1561) when approved by Architect.
- c. Type:
 - 1) Adjustable top clips.
 - a) Model: CRL Adjustable Mirror Clips for beveled edge or square edge mirrors and size to accommodate mirror thickness. (Unless indicated otherwise on Drawings.)
- d. Finish: As indicated on drawings from the following options:
 - 1) **1/4 -inch** thick mirror with square edges (seamed):
 - a) 64144: Nickel plated
 - b) 64114GLD: Gold plated
 - 2) **1/4 -inch** thick mirror with beveled edges:
 - a) 64114BV: Nickel plated
 - b) 64114BVGLD: Gold plated
 - 3) **3/8 -inch** thick mirror with square edges (seamed):
 - a) 64138: Nickel plated
 - 4) **1/2 -inch** thick mirror with square edges (seamed):
 - a) 64112: Nickel plated

2. Refer to drawings for mirror applications.

- D. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

1. Refer to drawings for applications that do not require mechanical fasteners.

- E. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.6 FABRICATION

- A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.
- B. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Rounded high-polished.
 - 1. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
 - 1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
 - 2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Provide a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Wall-Mounted Mirrors: Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Top Channel/Cleat and Bottom Aluminum J-Channels: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
 - 2. Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges.
 - a. Locate clips so they are symmetrically placed and evenly spaced.
 - 3. Install mastic at Public Restrooms, as follows when approved by Architect
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 -inch (3 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

- END OF SECTION -

- SECTION 08 9000 -**LOUVERS AND VENTS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Fixed extruded-aluminum louvers and accessories
 - 1. Free air flow types
 - a. Rectangular
 - b. Round
 - 2. Blanked off types

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 01 9113 "General Commissioning Requirements".
- D. Section 04 2115 "Adhered (Thin) Brick Masonry".
- E. Section 05 5000 "Metal Fabrications" for tube steel supports of units.
- F. Section 07 2400 "Exterior Insulation and Finish System (EIFS)".
- G. Section 07 9200 "Joint Sealants" for sealants installed in interior perimeter joints between louver frames and adjoining construction.
- H. Section 07 9213 "Exterior Façade Joint Sealants" for sealants installed in exterior perimeter joints between louver frames and adjoining construction.
- I. Section 08 4113 "Aluminum Framed Entrances and Storefronts".
- J. Section 08 4413 "Glazed Aluminum Curtain Walls".
- K. Section 08 1400 "Wood Doors" for door louvers.

- L. Section 09 2236 "Metal Lath & Accessories".
- M. Section 09 2513 "Acrylic Modified Portland Cement Plastering".
- N. Section 10 8213 "Exterior Screened Enclosures" for roof top mechanical screens with continuous louvers.
- O. Section 23 3113 "Metal Ducts".
- P. Section 23 3300 "Air Ducts Accessories".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.5 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300 "Submittal Procedures"

1.7 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- D. VOC Submittals:

1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 2. Show mullion profiles and locations.
 3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.
- F. Samples for Verification: For each type of metal finish required.

1.8 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
- B. Closeout Submittals:
1. Submit under provisions of Section 01 7700.
 2. Warranty: Submit specified warranty.

1.9 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
 3. AWS D1.6, "Structural Welding Code - Stainless Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

1.11 PROJECT CONDITIONS

- A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the Work.
 - 1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabrication of louvers and vents without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
- D. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to;
 - 1. SEI / ASCE 7.
 - 2. Phoenix Building Construction Code.
 - 3. Design earthquake spectral response acceleration, short period (Sds) for Project is indicated on Structural Drawings.
 - 4. Component Importance Factor is 1.0.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- F. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.

- B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.
- E. Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
 - 1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - 3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
 - 4. For fastening stainless steel, use 300 series stainless-steel fasteners.
 - 5. For color-finished louvers, use fasteners with heads that match color of louvers.
 - 6. Use types, gages, and lengths to suit unit installation conditions.
 - 7. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- F. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- G. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- H. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than mfg'r's standard available percentage..
- I. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

- A. General:
 - 1. Pre-assemble louvers in factory to minimize field splicing and assembly.
 - a. Disassemble units as necessary for shipping and handling limitations.
 - b. Clearly mark units for reassembly and coordinated installation.
 - 2. Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.
 - 3. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
 - 4. Fabricate frames, including integral sills, to fit in openings of size indicated with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.

- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or **72 -inches** o.c., whichever is less.
 - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
 - 2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
- G. Provide extended sills for recessed louvers.
 - 1. Provide sill extensions and loose sills made of same material as louvers, where indicated, as required for drainage to exterior and to prevent water penetrating to interior.
- H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.
- I. Fabricate frames, including integral sills, to fit in openings of size indicated with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.
- J. Join frame members to one another and to fixed louver blades as follows, unless otherwise indicated, or size of louver assembly makes bolted connections between frame members necessary:
 - 1. With fillet welds, concealed from view; or mechanical fasteners; or a combination of these methods; as standard with louver manufacturer.

2.4 FIXED ALUMINUM LOUVERS

- A. Basis-of-Design Product:
 - 1. Mfgr: Greenheck, www.greenheck.com
 - 2. Model EHH-601 High Performance Drainable Head and Blade Louver System; or a comparable product of one of the following:

LOUVERS AND VENTS

- a. Airolite Co.
 - b. Airstream Products Div., Penn Ventilator Co., Inc.
 - c. Arrow United Industries.
 - d. Construction Specialties, Inc. (C/S)
 - e. Reliable Metal Products.
 - f. Ruskin Mfg. Div., Phillips Industries, Inc.
- B. Louver Depth: **6 -inch** unless indicated otherwise on Drawings.
- C. Frame and Blade Nominal Thickness:
- 1. As required to comply with structural performance requirements, but not less than **0.080 - inch (2.0 mm)** for blades and **0.080 -inch (2.0 mm)** for frames.
- D. Mullion Type: Exposed.
- E. Performance Requirements:
- 1. Free Area: Not less than **7.58 sq.ft.** for **48-inch-** wide by **48-inch-** high louver.
 - 2. Point of Beginning Water Penetration: Not less than 1250 fpm
 - 3. Maximum Intake Volume Flow: 9475cfm
 - 4. Exhaust Volume Flow Rate @ **0.15 in.wg:** 6094cfm
 - 5. Air Performance: Not more than **0.324-inch** wg static pressure drop at 9475 fpm free-area velocity.
 - 6. Free area percentage: **47 percent**
 - 7. Wind-Driven Rain Test Results:
 - a. **100 percent** water penetration effectiveness at 29 mph & **3 -inch/hr³** rainfall
 - b. **99.1 percent** water penetration effectiveness at 50 mph & **8 -inch/hr³** rainfall
 - 8. Class rating: A
- F. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
- 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: Insect screening.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of **6 - inches (150 mm)** from each corner and at **12 -inches (300 mm)** o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
- 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.
- D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Stainless steel, 18 -inch by 18 -inch (1.4-mm by 1.4-mm) mesh, 0.009-inch (0.23-mm) wire, located at building louvers.

2.6 BLANK-OFF PANELS

- A. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
1. Thickness: 2 -inches (50 mm).
 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032 -inch (0.81-mm) nominal thickness.
 3. Metal Facing Sheets: Galvanized-steel sheet, not less than 0.028 -inch (0.71-mm) nominal thickness.
 4. Metal Facing Sheets: Stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness.
 5. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam .
 6. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080 -inch (2.03-mm) nominal thickness, with corners mitered and with same finish as panels.
 7. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
 8. Panel Finish: Same type of finish applied to louvers, but black color.
 9. Attach blank-off panels with sheet metal screws.

2.7 FIXED ROUND ALUMINUM DRYER VENTS

- A. Basis-of-Design Product:
1. Model **SFZC 6 Aluminum Dryer Vent** stationary vent grill with Backdraft Damper as manufactured by **SEIHO**, www.seiho.com, <http://www.seiho.com/product/index6.html>
 - a. Jason Pavlick, Toro-Air, San Diego, Jason@toroair.com)
 - b. Substitutions: Section 01 2500
 2. Performance:
 - a. Free area: Minimum 0.11 sq.ft. free area.
 3. Material:
 - a. Aluminum
 4. Assembly:
 - a. Round vent with horizontal louvers and radius eyebrow cap.
 - b. Backdraft Damper
 - c. Drain hole at exterior bottom of louver
 - d. Weather resistant
 - e. Perimeter flange
 - f. Internal Mounting springs to set into duct.
 - 1) Sealant required for installation, refer to Division 7 specifications.
 5. Configuration:
 - a. Hood:
 - 1) Diameter: 5 29/32 -inch
 - 2) Depth: 3 15/16 -inch
 - b. Vent:

- 1) Diameter: 6 -inch
 - c. Blade Profile: Plain blade.
 - d. Fasteners: Spring mounting clips
- 6. Finish:
 - a. Powder coated custom color
 - 1) Factory custom color as provided by Architect
 - 2) Refer to Drawings
- B. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.8 FINISHES

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish louvers after assembly.
- C. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss:
 - a. Color: Custom color to match Storefront / Curtain Wall color
 - 1) Refer to Section 08 4113 "Aluminum Framed Entrances and Storefronts"
 - 2) Refer to Section 08 4413 "Glazed Aluminum Curtainwalls"
 - 3) Refer to Architectural drawings
 - b. Acceptable Coatings Manufacturers:
 - 1) PPG Industries, Inc.
 - 2) Valspar Corporation
 - 3) BASF

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in concrete or masonry construction.
 - 1. Coordinate delivery of such items to project site.

3.2 INSTALLATION

- A. Locate and place louver units plumb, level, and in proper alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection. Systems shall be installed in a manner in which owner removal is accommodated.

- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect galvanized and nonferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry, or dissimilar metals.
- F. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation of louver.
- G. Install Blank Off panels at louvers not connected to ductwork, unless indicated otherwise.
 - 1. Louver above Roll-up door shall not be blanked off.
- H. Install partial Blank Off panels at louvers which are larger as indicated in Architectural drawings than the one called out in mechanical drawings.

3.3 ADJUSTING AND PROTECTION

- A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore louvers damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Project Inspector, remove damaged units and replace with new units.
 - 1. Clean and touch-up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.4 CLEANING

- A. Periodically clean exposed surfaces of louvers, which are not protected by temporary covering, to remove fingerprints and soil during construction period; do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and with a mild soap or detergent not harmful to finishes. Rinse thoroughly and dry surface.

- END OF SECTION -

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- SECTION 09 0511 -**CONCRETE FLOOR PREPARATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Mechanical preparation and cleaning of new concrete floor surfaces for application of the following finishes:
 - a. Sealers
 - b. Coatings
 - c. Flooring

1.3 RELATED REQUIREMENTS

- A. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 03 3000 "Cast-In-Place Concrete" for concrete floor slabs.
- D. Section 03 3570 "Water Vapor Emission Control System.
- E. Division 09 Sections for applied floor finishes.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
 - 1. Review conditions affecting substrate preparation.

2. Review procedures that will be used for substrate preparation.
3. Require attendance by Water Vapor Emission Control and Finish Flooring installers to review preparation requirements of floor finish product and flooring adhesive manufacturers

1.6 SUBMITTALS

- A. Product Data: For each type of mechanical cleaning equipment used on the project.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer performing surface preparation.
- B. Field quality-control reports.
 1. Submit report of observations.
 2. Certify installation is complete in accordance with manufacturer's instructions.
 3. Indicate supplementary instructions provided for Project specific conditions.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained in the use of the equipment and techniques required to produce the specified results.
- B. Mockups: Provide field mockups to set quality standards for surface preparation execution and for preconstruction testing.
 1. Provide mockup of typical surface preparation, minimum 100 sq. ft. area. Coordinate required size with requirements for preconstruction testing.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work when undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify new concrete floors have cured minimum 28 days.
- B. Examine substrates, with Installer present, for compliance with requirements for surface contamination, damage, and other conditions affecting performance of the Work.

- C. Examine substrate to determine repairs required to restore substrate surface to be within tolerances required for floor finishes specified in other sections, prior to completing Work of this section.
- D. Examine substrate to verify surfaces prepared in accordance with this section will be suitable for application of finishes specified in other sections.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance with recommendations for methods and materials required to correct conditions before proceeding with work of this section.
- F. Proceed with surface preparation only after unsatisfactory conditions have been corrected.
 - 1. Proceeding with surface preparations indicates acceptance and of surfaces and conditions of substrate.

3.2 SURFACE PREPARATION EQUIPMENT

- A. Mechanical Cleaning Equipment: Automatic, dry abrasive blast type, with vacuum recovery systems to control dust and collect surface abrasions.
- B. Mechanical Cleaning Equipment: Automatic, dry shot blast type, self contained capable of recycling blast materials and collecting surface abrasions.

3.3 SURFACE PREPARATION

- A. Mechanically clean concrete substrate and create surface profile in existing concrete substrate in accordance with ASTM D 4259.
 - 1. Mechanically clean concrete substrate to remove surface and penetrating contaminants to produce a surface profile of ICRI CSP 3 minimum, and greater as required by coating manufacturer in related sections, all in accordance with ICRI Technical Bulletin No. 03732.
 - 2. Acceptable substrate surfaces will be free of laitance, oil, grease, flooring adhesive, paint, and other surface contaminants capable of affecting bond of specified floor finishes to concrete substrate.
- B. Repair surface irregularities after cleaning.
 - 1. Fill bugholes, spalls, cracks, deteriorated joints and other surface damage exposed or created as a result of substrate cleaning operations flush with adjacent surfaces to provide sound substrate for specified floor finish.
- C. Dry broom or vacuum clean concrete substrates immediately before application of specified floor finishes in accordance with ASTM D 4258 to remove loose materials on substrate surface.
- D. When field quality control report indicates portions are unsatisfactory, repeat process until field quality control report indicates there are no unsatisfactory portions remaining.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform the following filed tests and inspections and prepare test reports:
1. Visual inspection of completed substrate preparation to verify contamination is removed.
 2. Visual inspection of completed substrate preparation to verify surface profile matches ICRI profile required for specified coating or finish, using ICRI standard rubber mold for visual comparison.
 3. Prepare field quality control report. Clearly indicate the locations, extents, and conditions of areas where surface preparation does not conform to specified profile and cleanliness. Document observed conditions with digital photographs.
 4. Repeat inspections when additional surface preparation for unsatisfactory conditions indicated in the previous field quality control report.

3.5 PROTECTION

- A. Protect prepared concrete substrates from contamination.
1. Reclean substrates that are contaminated by construction operations prior to installation of specified floor finishes.

- END OF SECTION -

- SECTION 09 0512 -**CONCRETE FLOOR MOISTURE CONTENT AND
PH TESTING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete moisture content testing using relative humidity method.
 - 2. Concrete pH testing.
 - 3. Concrete moisture testing of concrete decks to receive spray foam insulation.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4000 "Quality Requirements" for independent laboratory qualifications.
- C. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- D. Section 03 3000 "Cast-In-Place Concrete"
- E. Section 03 3500 "Concrete Finishing"
- F. Section 07 2236 "Water Vapor Emission Control Coating (flooring)" for moisture mitigation system treatment of concrete.
- G. Section 09 0511 "Concrete Floor Preparation".
- H. Section 09 6013 "Acoustic Underlayment.
- I. Division 09 Sections specifying floor moisture and pH testing.
 - 1. Owner to engage an Independent laboratory firm to perform testing of all concrete slabs (on grade and elevated) in accordance with ASTM F-2170, no sooner than 45 days prior to the installation of the finished flooring, scheduled to receive adhered floor coverings, such as carpet, resilient tile, resilient sheet goods, rubber tile, cork tile, ceramic tile and porcelain tile.

- J. Division 09 Floor Covering Sections, for installation requirements and to verify compatibility to the manufacturer's adhesives.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM International:
 - 1. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
 - 2. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - a. As required by each specific floor manufacturer.
 - 3. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
- B. Scheduling: Schedule work to permit concrete moisture testing to be completed minimum one week and maximum 3 weeks before floor coverings are installed.

1.6 ACTION SUBMITTALS

- A. Product Data:
 - 1. Submit data indicating model, manufacturer, and calibration record for relative humidity measuring equipment.
 - 2. Submit data for floor slab treatment products.
- B. Shop Drawings:
 - 1. Indicate test locations shown on building floor plans.

1.7 INFORMATIONAL SUBMITTALS

- A. Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for concrete moisture acceptable limits.
- B. Test Reports: Report test results in chart form.
 - 1. Relative Humidity Test Method: Indicate test dates, time, depth of test well, in-situ temperature, relative humidity and pH levels.
 - 2. Submit record of ambient air temperature, ambient relative humidity, and floor slab surface temperature when test sites are prepared, start of test, and end of test.
 - 3. Indicate condition of building enclosure including position of operable windows and exterior doors when test sites are prepared, start of test, and end of test.
 - 4. Submit transcript of datalogger.

CONCRETE FLOOR MOISTURE CONTENT AND PH TESTING

5. Indicate operational status of HVAC systems maintaining environmental condition of spaces where tests are conducted when test sites are prepared, start of test, and end of test.

1.8 FIELD CONDITIONS

- A. Probe Test:
 1. Turn off building heat during testing as required by Probe Test Manufacturer and ASTM F2170.
- B. Calcium Chloride:
 1. Do not perform concrete moisture testing until building is enclosed and HVAC system is operational.
 2. Maintain building test areas at design operating conditions for minimum 48 hours before, during, and continuously after conducting testing.
 3. When HVAC system is not operational at start of tests, maintain ambient conditions within test areas at **65 degrees F** to **85 degrees F** and **40 percent** to **60 percent** relative humidity for minimum 48 hours before, during, and continuously after conducting testing until building HVAC system is capable of maintaining design operating conditions.

PART 2 - PRODUCTS

2.1 RELATIVE HUMIDITY TEST EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Vaisala www.vaisala.com.
 2. Wagner Moisture Meters, Rapid RH, www.wagnermeters.com.
 3. Substitutions: Section 01 2500.
- B. Humidity and Temperature Probe and Meter:
 1. Comply with ASTM F2170.

2.2 PH TEST MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Micro Essential Laboratory www.microessentiallab.com.
 2. Substitutions: Section 01 2500.
- B. pH Test Paper: Capable of indicating minimum 7.0 to 13 pH range.
- C. pH Color Gage: Furnish pH test paper manufacturer's visual color gage to identify measured pH.
- D. Water: Distilled or de-ionized.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify new concrete floors have cured minimum 28 days.

3.2 PREPARATION

- A. When a building HVAC system is not operational and maintaining test areas at design operational conditions, install recording hygrometer or data logger in each separate test area to record ambient temperature and relative humidity beginning 48 hours before start of tests until completion of tests within each area.
- B. Identify three moisture test sites for first 1,000 sf and one moisture test site for each additional 1,000 sf of floor area receiving floor covering on each separate floor slab.
 - 1. Layout test site locations uniformly distributed throughout each test area.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform concrete moisture tests and inspections and prepare test reports:
- B. Acceptance Criteria:
 - 1. Verify flooring manufacturer's requirements for concrete substrate moisture content and pH limits.
 - 2. Concrete floor slabs will be considered acceptable for installation of floor finishes when:
 - a. Relative Humidity Test Result: 75 percent maximum relative humidity.
 - b. pH Test Result: Within alkalinity range of 7.0 to 9.0.
 - 3. When concrete floors do not meet acceptance criteria, obtain recommendations from floor finish manufacturers for remediation measures necessary to permit successful floor finish installation.
- C. Concrete Moisture Testing – General
 - 1. Conduct relative humidity test at each test site.
 - 2. Conduct one pH test at each test site.
- D. Relative Humidity Testing: (As required by each specific flooring manufacturer)
 - 1. Perform tests in accordance with ASTM F2170.
 - 2. Conduct relative humidity testing at the following depths:
 - a. Basement Slabs and Slabs-On-Grade: Measure temperature and relative humidity at 40 percent of slab thickness measured from top surface.
 - b. Elevated Slabs: Measure temperature and relative humidity at 20 percent of slab thickness measured from top surface.
 - 3. Drill test hole at each test site to accommodate test sleeve.
 - a. Hole Diameter: In accordance with test equipment manufacturer's instructions.

CONCRETE FLOOR MOISTURE CONTENT AND PH TESTING

- b. Drilling Fluids: Not permitted.
4. Vacuum dust and debris from test hole.
5. Insert sleeve, to the full depth of test hole. Cap or plug sleeve to prevent test hole contamination.
6. Remove sleeve plug and insert probe to bottom of test hole. Allow test probe to reach temperature equilibration with concrete slab.
7. Measure and record temperature and relative humidity at the test site.

E. pH Testing:

1. Place several drops of water onto the concrete surface to form a puddle approximately 1 inch in diameter.
2. Allow the water to set for approximately 60 seconds.
3. After 60 seconds, dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading.
4. Record and report results.

- END OF SECTION -

- SECTION 09 2116.23 -

GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Gypsum board shaft wall assemblies.
 - 2. Gypsum board Horizontal Shaftwall Duct Protection assemblies
 - 3. Gypsum board Horizontal Shaftwall Corridor Ceiling assemblies
 - 4. Gypsum board Horizontal Shaftwall Stair Soffit assemblies
 - 5. Control joints for rated wall assemblies.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 07 1600 "Sheathing" for exterior gypsum sheathing.
- E. Section 07 8446 "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board shaft-wall assemblies.
- F. Section 07 9200 "Joint Sealants"
- G. Section 09 2216 "Non-Structural Metal Framing" for non-load bearing metal framing and Firestop Tracks.
- H. Section 09 2900 "Gypsum Board" for sheathing and finishes.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM (American Society for Testing and Materials)
 - 1. ASTM C 840 Specification for Application and Finishing of Gypsum Board
 - 2. ASTM C 1396 Specification for Gypsum Board
- C. ICBO Evaluation Services, Inc.
 - 1. Evaluation Report No. 3579 for allowable values and/or conditions of use concerning material.
- D. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- E. Manufacturer's recommendations and specifications.

1.5 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Assembly test reports from a qualified independent testing agency certifying and substantiating compliance of gypsum board shaft-wall assemblies with structural and sound-attenuation performance requirements based on tests performed on manufacturers' standard assemblies representing those indicated.

1.7 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies firestop tracks, from ICC-ES.
- B. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700.
 - 2. Warranty: Submit specified warranty.

GYPSUM BOARD SHAFT-WALL ASSEMBLIES

1.8 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products" and UL's "Fire Resistance Directory."
- B. STC-Rated Assemblies: For gypsum board shaft-wall assemblies indicated to have STC ratings, provide assembly materials and construction complying with requirements of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- C. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Structural Performance:
 - 1. Provide gypsum board shaft-wall assemblies capable of withstanding the full air-pressure loads indicated for maximum heights of partitions without failing and while maintaining an airtight and smoke-tight seal. Evidence of failure includes deflections exceeding limits

indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled.

- C. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
 - 1. Refer to Drawings for specific assembly designation and compliance standard.
- D. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 MANUFACTURERS

- A. Approved Manufacturers:
 - 1. As specified.
 - 2. Refer to Section 09 2900

2.3 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing and inspecting agency.
- B. Fire-Resistance Rating: As indicated on drawings
- C. STC Rating: As indicated on Drawings.
- D. Deflection Limit: L/240
- E. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated.
 - a. Not less than required for specific assembly.
 - 1) Coordinate with Architect.
 - 2. Minimum Base Metal Thickness: As indicated on Drawings.
 - a. Not less than required for specific assembly.
- F. Runner Track: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer.
 - 1. Minimum Base Metal Thickness: As indicated on Drawings.
- G. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.
 - 1. As indicated in drawings and/or details.
 - 2. Refer to Section 09 2216 "Non-Structural Metal Framing"
- H. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 -inches (76 mm), matching studs in depth, and not less than 0.033 -inch (0.84 mm) thick.
- I. Room-Side Finish: As indicated

GYPSUM BOARD SHAFT-WALL ASSEMBLIES

- J. Shaft-Side Finish: As indicated
- K. Insulation: Sound attenuation blankets.
 - 1. Refer to Section 09 8100 "Acoustical Insulation"

2.4 NON-LOAD-BEARING STEEL FRAMING

- A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, **G40 (Z120)** unless otherwise indicated.
- B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Refer to drawings and/or details.
 - 2. Refer to Section 09 2216 "Non-Structural Metal Framing"

2.5 AUXILIARY MATERIALS

- A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.
 - 1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
 - 2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 2900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 -inch** to **0.112 -inch** thick.
- D. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
 - a. Refer to drawings
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.
 - a. Refer to drawings

- E. Steel Framing: ASTM C 645.
 - 1. Protective Coating: ASTM A 653, G40, hot-dip galvanized coating
- F. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Section 09 2900 "Gypsum Board", that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.
- G. Acoustical Sealant: As specified in Section 07 9200 "Joint Sealants".
- H. Sound Attenuation Blankets: As specified in Section 09 8100 "Acoustical Insulation"
- I. Acoustical Sealant: As specified in Section 07 9200 "Joint Sealants".
- J. Control Joints:
 - 1. Type: For fire rated assemblies with integral intumescent tape.
 - 2. Mfgr: CEMCO, www.cemcosteel.com .
 - 3. Model: FAS-093X
 - 4. Design: WW-D-0172:
 - 5. Standards:
 - a. ASTM A653
 - b. ASTM A1003 Grade 33 Type H for 33 Ksi yield strength.
 - 6. Approvals:
 - a. UL-2079 "Test For Fire Resistance of Building Joint Systems"

2.6 GYPSUM BOARD SHAFT WALL ASSEMBLY

- A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing and inspecting agency.
- B. Deflection Limit: L/240
- C. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated.
 - 2. Minimum Base Metal Thickness: As indicated on Drawings.
- D. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer.
 - 1. Minimum Base Metal Thickness: As indicated on Drawings.
- E. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.0341 -inch thick.
- F. STC Rating: As indicated on Drawings.

2.7 PANEL PRODUCTS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Gypsum Shaft-Liner Panels:
 - 1. Acceptable Manufacturers:
 - a. Certain Teed
 - b. National Gypsum
 - c. PABCO
 - d. USG
 - 2. Rating: Type "X"
 - 3. Description: Water resistant gypsum core surfaced with coated glass mat facings that resist growth of mold and mildew and does not support fungus growth per ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber".
 - 4. Thickness: 1 -inch
 - 5. Standards:
 - a. Mold resistance: ASTM D 3273, Score 10
- C. Gypsum Wallboard: Type X, ASTM C 1629 for Impact-Resistant, core type as required by fire-resistance-rated assembly indicated.
 - 1. Refer to Section 09 2900 "Gypsum Board".
 - a. Type: Impact Resistant:
 - 1) Single Layer: Hard Body Category 3, Level 3 where indicated on Drawings for single layer of gypsum board.
 - 2) Dual layer: Abuse-Resistant, Category 2, Level 2 applications
- D. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Section 09 2900 "Gypsum Board".

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in;
 - 1. Section 07 8100 "Applied Fireproofing."
- B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

- A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
 - 1. ASTM C 754 for installing steel framing.
 - 2. Section 09 2900 "Gypsum Board", for applying and finishing panels.
- B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
 - 1. Elevator Hoistway: At elevator hoistway door frames, provide jamb struts on each side of door frame.
 - 2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch (0.84-mm) minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.
 - a. Size of reinforcing plate as shown on Drawings.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 1. Section 09 2216 "Non-Structural Metal Framing"
- G. Control Joints:

GYPSUM BOARD SHAFT-WALL ASSEMBLIES

1. Install control joints at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
 2. Install control joints to maintain fire-resistance rating of assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Cant Panels: At projections into shaft exceeding 2 -inches and/or where indicated, install 1/2 -inch or 5/8 -inch- (13-mm or 16-mm-) thick gypsum board cants covering tops of projections.
1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 -inches (610 mm) o.c. with screws fastened to shaft wall framing.
 2. Where steel framing is required to support gypsum board cants, install framing at 24 -inches (610 mm) o.c. and extend studs from the projection to shaft wall framing.
- J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 -inch (3 mm) from the plane formed by faces of adjacent framing.
- K. Stairs:
1. Integrate stair hanger rods with gypsum board shaft-wall assemblies by locating cavity of assemblies where required to enclose rods.
- L. Sealing:
1. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

- END OF SECTION -

- SECTION 09 2216 -**NON-STRUCTURAL METAL FRAMING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes;
 - 1. Non-load-bearing metal framing systems including, but not limited to the following applications:
 - a. Interior partitions.
 - b. Interior soffits.
 - c. Interior furring.
 - d. Supports for partition walls.
 - 2. Accessory components including, but not limited to; Backing, Bridging, Bracing and flat strapping.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 05 4000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
- D. Section 05 5000 "Metal Fabrications" for items not specified in 09 2216 and/or 05 4000.
- E. Section 07 2100 "Thermal Insulation" for insulation installed at exterior skin and roof conditions not addressed in other sections.
- F. Section 07 8446 "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing unless specified otherwise.
- G. Section 09 2116.23 "Gypsum Board Shaft-Wall Assemblies"
- H. Section 09 2226 "Gypsum Board Ceiling Suspension Systems" for suspended gypsum board ceiling systems other than acoustical tile grid systems.

- I. Section 09 2900 "Gypsum Board Assemblies" for gypsum panels.
- J. Section 09 8100 "Acoustical Insulation" for interior conditions.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. AISI's North American Specification for the Design of Cold-Formed Steel Structural Members
- C. ASTM International, www.astm.org
 - 1. ASTM A591 – Standard Specification for sheet steel, electrolytic zinc-coated, for light coating weight (mass) applications.
 - 2. A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - 3. ASTM A653 - Standard specification for steel sheet, zinc-coated (galvanized) by the hot-dip process
 - 4. ASTM A1003 - Standard specification for steel sheet, carbon, and metallic-coated for cold-formed framing members
 - 5. ASTM C635 - Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
 - 6. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - 7. ASTM C645 - Standard specification for nonstructural steel framing members
 - 8. ASTM C754 - Standard specification for installation of steel framing members to receive screw-attached gypsum panel products
 - 9. ASTM C955 - Standard specification for load-bearing (transverse and axial) steel studs, runners (tracks), and bracing or bridging for screw application of gypsum panel products and metal plaster bases
 - 10. ASTM C1047 – Standard Specification for accessories for gypsum wallboard and gypsum veneer base.
 - 11. ASTM E72 - Standard test methods of conducting strength tests of panels for building construction
 - 12. ASTM E90 - Standard test method for laboratory measurement of airborne sound transmission loss of building partitions and elements
 - 13. ASTM E119 - Standard test methods for fire tests of building construction and materials
- D. CSSA, Certified Steel Stud Association, www.certifiedsteelstud.com
- E. Gypsum Association (GA) GA-600 - Fire Resistance Design Manual
- F. ICC Evaluation Service.
- G. SFIA, Steel Framing Industry Association, www.steel framing association.org
- H. SSMA – Steel Stud Manufacturers Association, www.ssma.com
- I. SSFSA – Supreme Steel Framing System Association, www.supremesteelframing.net

- J. UL, Underwriters Laboratories.
 - 1. UL (FRD) - Fire Resistance Directory

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product detailed or specified.
 - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports for: (From ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction)
 - 1. Steel studs and runners.
 - 2. Embossed Steel studs and runners web.
 - 3. Knurled Steel studs flanges.
 - 4. Firestop tracks.

1.7 QUALITY ASSURANCE

- A. Manufacturer: Current member of one of the following organizations:
 - 1. CSSA, Certified Steel Stud Association, www.certifiedsteelstud.com
 - 2. SFIA, Steel Framing Industry Association, www.steelframingassociation.org
 - 3. SSMA – Steel Stud Manufacturers Association, www.ssma.com
 - 4. SSFSA – Supreme Steel Framing System Association, www.supremesteelframing.net
- B. Installer Qualifications: Minimum five (5) years documented experience in work of this Section
- C. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack studs and tracks flat and supported on risers on a flat platform to prevent sagging.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Horizontal Deflection: (Unless indicated to be thicker mil thickness or more restrictive criteria on Drawings)
 - 1. For wall assemblies, limited to L/240 of the wall height based on horizontal loading of 10 lbf/sq. ft. (480 Pa).
 - 2. If partition height exceeds stud manufacturer's limiting height for applicable loading and deflection, install bracing above ceiling, decrease stud spacing, or increase stud gage as approved by Architect.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25] <Insert number> percent.
- D. Vertical Deflection: Provide cold-formed metal framing and firestop tracks capable of withstanding deflection within limits and under conditions indicated.
 - 1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 3/4 -inch (19 mm) unless otherwise indicated and/or required by specific wall design.

2.2 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

2.3 FRAMING SYSTEMS - NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

NON-STRUCTURAL METAL FRAMING

2. Protective Coating: ASTM A 653/A 653M, **G40 (Z120)** , hot-dip galvanized unless otherwise indicated.
 - a. All framing at damp/wet locations such as showers and restrooms shall have a **G60** coating.
 - b. All framing carrying a load greater than **10 lbf/sq. ft. (480 Pa)** shall have a **G60** coating.

2.4 FRAMING SYSTEMS - STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Studs and Runners: ASTM C 645. (Use either steel studs and runners or embossed steel studs and runners / tracks).
 1. Steel Studs and Runners/Tracks:
 - a. Acceptable manufacturers:
 - 1) **CEMCO**, California Expanded Metal Products Co., City of Industry, CA., www.cemcosteel.com
 - 2) **SCAFCO Corporation**, Spokane, WA., www.scafco.com
 - 3) **MBA Building Framing**, Libertyville, IL., www.mbastuds.com
 - 4) **MRI Steel Building Framing**, LLC, Gary, IN., www.mristeel framing.com.
 - 5) **Telling Industries**, Kingman, AZ, www.tellingindustries.com
 - b. Minimum Base-Metal Thickness:
 - 1) **0.0296 inch (0.752 mm) (30mils)**
 - c. Strength:
 - 1) **33 ksi**, minimum
 - d. Depth:
 - 1) As indicated on Drawings
 2. Embossed Steel Studs and Runner/Tracks:
 - a. Acceptable manufacturers:
 - 1) **ClarkDietrich**, West Chester, OH 45069, www.clarkdietrich.com ,
 - b. Minimum Base-Metal Thickness:
 - 1) **0.0296 inch (0.752 mm) (30mils)**
 - c. Depth:
 - 1) As indicated on Drawings
- B. Slip-Type Head Joints: Where indicated, provide one of the following:
 1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing **1-1/2-inch (38-mm)** minimum vertical movement unless indicated otherwise on Drawings.
 - a. **Clark Dietrich**, West Chester, OH 45069, www.clarkdietrich.com ,
 - b. **Fire Track Corporation**, Kimball, MN 55353, www.firetrak.com ,
 2. Single Long-Leg Runner System: ASTM C 645 top runner with **2-inch (51-mm-)** deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within **12 -inches (305 mm)** of the top of studs to provide lateral bracing.
 3. Double-Runner System: ASTM C 645 top runners, inside runner with **2-inch (51-mm-)** deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

- a. **Clark Dietrich**, West Chester, OH 45069, www.clarkdietrich.com ,
 - b. Substitutions, refer to 01 2500.
 4. Deflection Track (Slotted leg): Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. **CEMCO**, California Expanded Metal Products Co., City of Industry, CA., www.cemcosteel.com
 - b. **Clark Dietrich**, West Chester, OH 45069, www.clarkdietrich.com ,
 - c. **MBA Building Framing**, Libertyville, IL., www.mbastuds.com
 - d. **SCAFCO Corporation**, Spokane, WA., www.scafco.com
 - e. **Telling Industries**, Kingman, AZ, www.tellingindustries.com
- C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
 1. Basis of Design: Refer to Section 07 8446 "Fire-Resistive Joint Systems."
 - a. Coordinate Shaft wall assemblies with Section 09 2116.23 "Gypsum Board Shaft Wall Assemblies"
 2. Basis-of-Design UL-Classified Product, HW-D Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
 - a. Mfgr:
 - 1) **ClarkDietrich**, www.clarkdietrich.com, **Blaze Frame** by **Blazeframe Industries**, 8805 148th Ave NE, Redmond, WA 98052, 425.869-2811, www.blazeframe.com
 - 2) Alternate manufacturer's:
 - a) **CEMCO**, California Expanded Metal Products Co., City of Industry, CA., **FAS Track 1000**, www.cemcosteel.com
 - b) Refer to Section 01 2500
 - b. Application:
 - 1) Fire rated wall assemblies.
 - 2) Assemblies where detailed
 - 3) Where noted on Drawings.
 - c. Description:
 - 1) Ceiling runner designed to allow head-of-walls to compress or extend with movement of structure above while maintaining the fire-rating of the wall assembly by a factory applied cured intumescent fire stop material affixed to steel profile. Comply with requirements of ASTM C 645, of thickness indicated for studs and of width to accommodate depth of studs indicated. The fire-rated assembly shall be capable of unencumbered movement as required and indicated in the drawings and/or details. The assemblies shall have been tested and listed in accordance with UL 2079, ASTM E 1996, ASTM E 814 and ULC S115-M95.
 - 2) Assembly Rating: 1 hour or greater.
 - 3) Nominal Joint Width: 3-inches, unless allowed otherwise by Blazeframe tested assembly

- 4) Movement Capabilities: Minimum of 40 percent compression or extension for deflection type tracks.

d. Products:

- 1) **Blazeframe Industries**, 8805 148th Ave NE, Redmond, WA 98052, 425.869-2811, www.blazeframe.com or alternate as herein listed
- 2) Track type as required for wall assembly and/or shaft wall assembly including but not limited to;
 - a) DSL2 (Deep Leg – Slotted both sides, Deflection track with composite intumescent strip each side
 - b) SL1 (Deep Leg Slotted one side) with composite intumescent strip on slotted side
 - c) DL (Deep Leg) Solid, Series 1 with composite intumescent strip one side
 - d) DL (Deep Leg) Solid, Series 2 with composite intumescent strip each side
 - e) DL2 Deep Leg Deflection track with composite intumescent strip each side
 - f) DSL2 Deep Leg Slotted Deflection track with composite intumescent strip each side
 - g) ODL2 Offset Deep Leg Deflection track with composite intumescent strip each side
 - h) ODSL2 Offset Deep Leg Slotted Deflection track with composite intumescent strip each side
 - i) JR (J-Runner), with composite intumescent strip one side for shaft wall assemblies
- 3) Coordinate Shaft wall assemblies with Section 09 2116 "Gypsum Board Shaft Wall Assemblies"
- 4) Rated wall assemblies coordinate with Section 09 2216 "Non-Structural Metal Framing"

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated but not less than 6 -inches wide by 10 -foot lengths.

1. Acceptable manufacturers:
 - a. Meeting specified criteria and supplied by same manufacturer as metal stud framing.
2. Minimum Base-Metal Thickness:
 - a. 0.0428 -inch (43 mils)
 - 1) Design: 0.0451 inch (1.024 mm) (43 mils)

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) (54 mils) minimum base-metal thickness, with minimum 1/2-inch (13-mm-) wide flanges.

1. Acceptable manufacturers:
 - a. Meeting specified criteria and supplied by same manufacturer as metal stud framing.
2. Depth: As indicated on Drawings, otherwise 1-1/2 inches (38 mm).
3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.0677-inch (1.72-mm-) (68 mils) thick, galvanized steel.

- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Acceptable manufacturers:
 - a. Meeting specified criteria and supplied by same manufacturer as metal stud framing.
 2. Minimum Base-Metal Thickness:
 - a. 0.0329 inch (0.836 mm) (33 mils)
 3. Depth: As indicated on Drawings, otherwise to be selected from the following as required for specific condition; 7/8 inch (22.2 mm) and 1-1/2 inches (38 mm).
- G. Resilient Furring Channels: Single Leg 1/2-inch (13-mm-) deep by 0.0179 -inch (0.0455 mm) (18 mils), minimum (25 gauge), steel sheet members designed to reduce sound transmission.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. CEMCO, California Expanded Metal Products Co., City of Industry, CA., www.cemcosteel.com
 - b. MRI Steel Building Framing, LLC, Gary, IN., www.mristeel framing.com
 - c. SCAFCO Corporation, Spokane, WA., www.scafco.com
 - d. Telling Industries, Kingman, AZ, www.tellingindustries.com
 2. Configuration: Asymmetrical.
- H. Resilient Furring Channels: Double legs at 1/2-inch (13-mm-) deep by 0.0179 -inch (18 mils), minimum (25 gauge), steel sheet members designed to reduce sound transmission.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. CEMCO, California Expanded Metal Products Co., City of Industry, CA., www.cemcosteel.com
 - b. Telling Industries, Kingman, AZ, www.tellingindustries.com
 2. Configuration: Hat shaped with double legs.
- I. Cold-Rolled Furring Channels: 0.0538 -inch (1.37-mm) (54 mils) uncoated-steel thickness, with minimum 1/2 -inch (13-mm) wide flanges.
1. Depth: As indicated on Drawings .
 - a. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0329 inch (0.836 mm) (33 mils)
 2. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625 -inch (1.59-mm-) diameter wire, or double strand of 0.048 -inch (1.21-mm-) diameter wire.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 -inches (31.8 mm), wall attachment flange of 7/8 -inch (22.2 mm), minimum bare-metal thickness of 0.0179 -inch (0.0455 mm) (18 mils), and depth required to fit insulation thickness indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. SCAFCO Corporation, Spokane, WA., www.scafco.com
 - b. MBA Building Framing, Libertyville, IL., www.mbastuds.com
 - c. MRI Steel Building Framing, LLC, Gary, IN., www.mristeel framing.com
 - d. Telling Industries, Kingman, AZ, www.tellingindustries.com
- K. Cavity Shaft-Wall Assemblies:

1. Refer to Section 09 2116.23 "Gypsum Board Shaft Wall Assemblies"

L. Cold-Formed Metal Framing:

1. Refer to Section 05 4000 "Cold-Formed Metal Framing"

2.5 SUSPENSION SYSTEMS, COLD FORMED FRAMING

- A. Refer to Section 09 2226 "Gypsum Board Ceiling Suspension Systems"

2.6 SUSPENSION SYSTEMS FOR GYPSUM BOARD, MANUFACTURED

- A. Refer to Section 09 2226 "Gypsum Board Ceiling Suspension Systems"

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing:
 - a. Attachment to substrates: Of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates and meet design requirements.
 - b. Framing attachment to framing and accessory components: Of type, material, size, corrosion resistance, holding power and other properties required to meet design requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Coordinate with other trades for installation in advance of time needed for coordination and construction.

3.2 PREPARATION

- A. Coordination with Sprayed Fire-Resistive Materials:
 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 -inches (600 mm) o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive

materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

- B. Suspended Assemblies:
 - 1. Refer to Section 09 2226 "Gypsum Board Ceiling Suspension Systems"

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members.
 - 1. Frame both sides of joints independently.
- E. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
- F. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application:
 - a. 16 -inches (406 mm) o.c. unless otherwise indicated.
 - 2. Multilayer Application:
 - a. 16 -inches (406 mm) o.c. unless otherwise indicated.
 - 3. Tile Backing Panels:
 - a. 16 -inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

NON-STRUCTURAL METAL FRAMING

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated and/or required by wall design, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than two (2) studs at ends of arcs, place studs 6 -inches (150 mm) o.c.
- E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 -inches (610 mm) o.c.
 2. Attach to metal stud and track framing with type, material, size, corrosion resistance, holding power and other properties required to meet design requirements.
- F. Z-Furring Members:
1. Erect insulation (specified in Division 7 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 -inches (610 mm) o.c.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 -inches (600 mm) o.c.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 -inches (300 mm) from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 -inch (3 mm) from the plane formed by faces of adjacent framing.
1. ASTM C 840 for metal framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Refer to Section 09 2226 "Gypsum Board Ceiling Suspension Systems".

- END OF SECTION -

- SECTION 09 2226 -**GYPSUM BOARD CEILING SUSPENSION SYSTEMS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-Formed Suspension systems for interior ceilings and soffits.
 - 2. Grid suspension systems for gypsum board ceilings.
 - 3. Suspension systems for interior gypsum ceilings and grid systems for Indoor Pool 404, Open Bar 401, Storage 425 and as indicated on Drawings for high humidity rooms with all components galvanized.
 - a. Confirm with Drawings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 01 8113 "Sustainable Design Requirements".
- D. Section 05 0810 "Galvanized Finishes on Steel" for galvanized finish and for field repair of galvanized finish.
- E. Section 05 0900 "Anchors and Fasteners".
- F. Section 05 4000 "Cold-Formed Structural Metal Framing" for exterior and interior load-bearing and exterior load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
- G. Section 07 2100 "Thermal Insulation" for insulation installed at exterior skin and roof conditions not addressed in other sections.
- H. Section 07 8446 "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing unless specified otherwise.

- I. Section 09 2216 "Non-Load Bearing Metal Framing" for light gauge metal framing used for interior and non-load bearing wall, ceiling and soffit framing and metal blocking.
- J. Section 09 2900 "Gypsum Board"
- K. Section 09 5123 "Acoustical Tile Ceilings"
- L. Section 09 8100 "Acoustical Insulation" for interior conditions.
- M. Section 09 9628 "High Performance Acrylic Finishes For Indoor Pools"

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. AISI's North American Specification for the Design of Cold-Formed Steel Structural Members
- C. ASTM International, www.astm.org
 - 1. ASTM A591 – Standard Specification for sheet steel, electrolytic zinc-coated, for light coating weight (mass) applications.
 - 2. ASTM D 610 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
 - 3. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - 4. ASTM A653 - Standard specification for steel sheet, zinc-coated (galvanized) by the hot-dip process
 - 5. ASTM A1003 - Standard specification for steel sheet, carbon, and metallic-coated for cold-formed framing members
 - 6. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
 - 7. ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus
 - 8. ASTM C635 - Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
 - 9. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - 10. ASTM C645 - Standard specification for nonstructural steel framing members
 - 11. ASTM C754 - Standard specification for installation of steel framing members to receive screw-attached gypsum panel products
 - 12. ASTM C955 - Standard specification for load-bearing (transverse and axial) steel studs, runners (tracks), and bracing or bridging for screw application of gypsum panel products and metal plaster bases
 - 13. ASTM C1002 Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
 - 14. ASTM C1047 – Standard Specification for accessories for gypsum wallboard and gypsum veneer base.
 - 15. ASTM E72 - Standard test methods of conducting strength tests of panels for building construction
 - 16. ASTM E90 - Standard test method for laboratory measurement of airborne sound transmission loss of building partitions and elements
 - 17. ASTM E119 - Standard test methods for fire tests of building construction and materials

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- D. CSSA, Certified Steel Stud Association, www.certifiedsteelstud.com
- E. GESR-1289 ICC-ES Evaluation Report for manufactured ceiling suspension systems.
- F. Gypsum Association (GA) GA-600 - Fire Resistance Design Manual
- G. ICC Evaluation Service.
- H. NOA #07-0119.02 Miami/Dade Wind Uplift.
- I. NAO #09-0512.02 Miami/Dade Impact.
- J. SFIA, Steel Framing Industry Association, www.steelframingassociation.org
- K. SSMA – Steel Stud Manufacturers Association, www.ssma.com
- L. SSFSA – Supreme Steel Framing System Association, www.supremesteelframing.net
- M. UL, Underwriters Laboratories.
 - 1. UL (FRD) - Fire Resistance Directory

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product detailed or specified.
 - 1. Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports for: (From ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction)
 - 1. Steel studs and runners.
 - 2. Embossed Steel studs and runners web.
 - 3. Knurled Steel studs flanges.
 - 4. Firestop tracks.
 - 5. Shaft wall assemblies.

1.7 QUALITY ASSURANCE

- A. Cold formed components manufacturer: Current member of one of the following organizations:
 - 1. CSSA, Certified Steel Stud Association, www.certifiedsteelstud.com
 - 2. SFIA, Steel Framing Industry Association, www.steel framing association.org
 - 3. SSMA – Steel Stud Manufacturers Association, www.ssma.com
 - 4. SSFSA – Supreme Steel Framing System Association, www.supremesteelframing.net
- B. Installer Qualifications: Minimum five (5) years documented experience in work of this Section
- C. Manufactured Ceiling Suspension System:
 - 1. Single-Source Responsibility: To ensure proper interface, all drywall furring components shall be produced or supplied by a single manufacturer.
 - 2. All accessory components from other manufacturers shall conform to ASTM standards.
 - 3. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings function as a fire protective membrane and tested per ASTM E 119. Installation in accordance with the UL Design being referenced.
- D. Coordination of Work:
 - 1. Coordinate drywall furring work with installers of related work including, but not limited to acoustical ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
 - 2. All work above the ceiling line should be completed prior to installing the drywall sheet goods. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties.
- E. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- F. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack studs and tracks flat and supported on risers on a flat platform to prevent sagging.
- C. Manufactured Ceiling Suspension System:
 - 1. Deliver materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

1.9 WARRANTY

- A. Comply with provisions of Section 01 7700 "Closeout Procedures".
- B. Manufactured Ceiling Suspension System:
 - 1. Provide single source warranty.
 - 2. Suspensions System: Submit a written limited warranty executed by the manufacturer, agreeing to repair or replace grid components that are supplied with a hot-dipped galvanized coating or aluminum base material.
 - a. Failures include, but are not limited to:
 - 1) The occurrence of 50 percent red rust as defined by ASTM D 610 test procedures as a result of defects in materials or factory workmanship.
 - 3. Warranty Period: Grid: Ten (10) years.
 - 4. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 SUSPENSION SYSTEMS, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120) , hot-dip galvanized unless otherwise indicated.
 - a. All ceiling framing at damp/wet locations such as showers and restrooms shall have a G60 coating.
 - b. All ceiling framing carrying a load greater than 10 lbf/sq. ft. (480 Pa) shall have a G60 coating.
- B. Acoustical Panel Ceilings:
 - 1. Refer to Section 09 5113 "Acoustical Panel Ceilings"

2.3 SUSPENSION SYSTEMS, COLD FORMED FRAMING

- A. Protective Coating:
 - 1. ASTM A 653/A 653M, **G60 (Z180)** hot-dip galvanized unless otherwise indicated.
- B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.0625-inch (1.59-mm-)** diameter wire, or double strand of **0.048-inch (1.21-mm-)** diameter wire.
- C. Hanger Attachments to Concrete:
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
 - a. Refer to Structural Drawings for additional information and requirements.
 - b. Refer to Structural Drawings for Post-Tensioned Concrete Slabs.
 - 1) Refer to Section 03 3816 "Unbonded Post-Tensioned Concrete"
- D. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.16-inch (4.12-mm)** diameter.
- E. Flat Hangers: Steel sheet, **1 -inch** by **3/16 inch (25mm by 5 mm)** by length indicated .
- F. Carrying Channels: Cold rolled, commercial-steel sheet with a base-metal thickness of **0.0538-inch (1.367-mm) (54 mils)** and minimum **1/2 -inch (13-mm)** wide flanges.
 - 1. Depth:
 - a. As indicated on Drawings, otherwise **2 -inches** minimum.
 - 2. Capacity: **590 lb** per **1000 -feet**, unless otherwise indicated.
- G. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: **0.0538-inch (1.367-mm) (54 mils)** uncoated-steel thickness, with minimum **1/2-inch (13-mm-)** wide flanges, **3/4 -inch (19 mm)** deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness:
 - 1) **0.0329 -inch (0.836 mm)**.
 - b. Depth:
 - 1) As indicated on Drawings
 - 3. Embossed Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness:
 - 1) **0.0296 inch (0.752 mm) (30mils)**
 - b. Depth:
 - 1) As indicated on Drawings
 - 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, **7/8 -inch (22 mm)** deep.
 - a. Minimum Base-Metal Thickness:

GYPSUM BOARD CEILING SUSPENSION SYSTEMS

1) 0.0329 inch (0.836 mm) (33 mils)

5. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

a. Minimum Base-Metal Thickness:

1) 0.0329 inch (0.836 mm) (33 mils)

H. Resilient Furring Channels: Single Leg 1/2-inch (13-mm-) deep by 0.0179 -inch (0.0455 mm) (18 mils), minimum (25 gauge), steel sheet members designed to reduce sound transmission.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. **CEMCO**, California Expanded Metal Products Co., City of Industry, CA., www.cemcosteel.com

b. **MRI Steel Building Framing**, LLC, Gary, IN., www.mristeel framing.com.

c. **SCAFCO Corporation**, Spokane, WA., www.scafcocom

d. **Telling Industries**, Kingman, AZ, www.tellingindustries.com

2. Configuration: Asymmetrical.

I. Resilient Furring Channels: Double legs at 1/2-inch (13-mm-) deep by 0.0179 -inch (18 mils), minimum (25 gauge), steel sheet members designed to reduce sound transmission.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. **CEMCO**, California Expanded Metal Products Co., City of Industry, CA., www.cemcosteel.com

b. **Telling Industries**, Kingman, AZ, www.tellingindustries.com

2. Configuration: Hat shaped.

2.4 SUSPENSION SYSTEMS FOR GYPSUM BOARD, MANUFACTURED

A. Structural Classification:

1. Main Beam shall be heavy duty per ASTM C 635.

2. Classification can require wires to be closer together for additional loading when used to support double layer gypsum, verticals, slopes, domes, half barrels, circles, soffits, canopies, and step conditions which call for loading or unusual designs and shapes in drywall construction. Using cross tees in the construction of circles, barrels, etc. is common in order to hold the radius.

3. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span.

B. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following :

2. Products: Subject to compliance with requirements, provide one of the following :

a. Basis of Design: **Armstrong World Industries, Inc; Drywall Grid Systems for Drywall/Stucco/Plaster**, www.armstrong.com

b. Chicago Metallic Corporation; www.chicago-metallic.com, www.rockfon.com

1) 640/660 Drywall Ceiling Suspension

- 2) 650/670 Fire Rated Drywall Ceiling Suspension
- 3) Radius Drywall Ceiling Suspension
- 4) SpanFast Drywall Ceiling Suspension for Corridors.
- c. USG, United State Gypsum Company; www.usg.com
 - 1) Drywall Suspension Systems
 - 2) Wall-to-Wall Drywall Suspension System.
- d. DONN® Drywall Suspension System (USG Corporation)

C. Components:

- 1. Main Beam: Shall be double-web construction (minimum 0.0179 -inch prior to protective coating, ASTM C645), hot dipped galvanized (per ASTM A653).
 - a. Specific components as required for complete installed system.
- 2. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (minimum G90 per ASTM A653)
 - a. Specific components as required for complete installed system.
- 3. QuikStix Soffits DGS: Shall be double web steel construction (minimum 0.0179 -inch prior to protective coating, ASTM C645), Tees designed for creating soffits; 1 1/2 -inch web height. 1 1/2 -inch flange, flattened bulb, bending crimp, knockouts and alignment holes to facilitate creating 15, 30, 45, 60 and 90 degree angles; G90 hot dipped galvanization.
 - a. Specific components as required for complete installed system.
- 4. Wall Molding:
 - a. Specific components as required for complete installed system.
- 5. Transition Molding: Drywall to Acoustical ceiling.
 - a. Pre-Painted Armstrong Global White integral acoustical flange and drywall taping flange, hot dipped cold rolled steel.
 - 1) Specific components as required for complete installed system.
- 6. Axiom Aluminum extrusion Pre-Painted Armstrong Global White integral acoustical flange and drywall taping flange.
 - a. Specific components as required for complete installed system.
- 7. Clips:
 - a. Specific components as required for complete installed system.
- 8. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.
- 9. Metal Trim or Plastic Members (by others):
 - a. Corner bead: Minimum #26 gauge, zinc alloy or plastic square edge type with expanded flanges.
 - b. Casing bead: Minimum #24 gauge, zinc alloy or plastic square edge type with expanded flanges.
 - c. Control Joints: Minimum #26 gauge, roll-formed zinc alloy, extruded aluminum or plastic with expanded flanges.
 - d. Special Trim Shapes: As detailed on plans, extruded aluminum with acrylic coating by Fry Reglet or approved equal.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.

GYPSUM BOARD CEILING SUSPENSION SYSTEMS

1. Fasteners for Metal Framing:
 - a. Attachment to substrates: Of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates and meet design requirements.
 - b. Framing attachment to framing and accessory components: Of type, material, size, corrosion resistance, holding power and other properties required to meet design requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
 2. Coordinate with Drawings for types allowed and required.
- B. Coordination with Sprayed Fire-Resistive Materials:
 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 -inches (610 mm) o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing.
 - a. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated.
 - b. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install bracing at terminations in assemblies.
- C. Do not bridge building control and expansion joints with non-load-bearing steel framing members.
 - 1. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS, COLD FORMED FRAMING

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
 - 1. Hangers: 48 -inches (1219 mm) o.c.
 - 2. Carrying Channels (Main Runners): 48 -inches (1219 mm) o.c.
 - 3. Furring Channels (Furring Members): 16 -inches (406 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

GYPSUM BOARD CEILING SUSPENSION SYSTEMS

- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within **1/8 -inch** in **12 -feet (3 mm in 3.6 m)** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING SUSPENSION SYSTEMS, MANUFACTURED

- A. General:
 1. Install manufacturers suspension system components in sizes and spacings per manufacturers engineered design, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
 2. Install suspension system and panels in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.
 3. The Armstrong Drywall Grid System can be installed in interior or exterior applications.
 4. To secure to metal clips, concrete inserts, steel bar joist or steel deck, use power actuated fastener, or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.
 5. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations.
 - a. Provide additional wires at light fixtures, grilles, and access doors where necessary.
 - b. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.
 6. Add additional wire as needed when using compatible clips and accessories.
 7. Control Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.
 8. Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.
 9. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.
 10. Install cross tees at on center spacing as specified by the drywall manufacturer.
 - a. Typical drywall cross tee spacing:
 11. **16 -inches** on center with **5/8 -inch** or **1/2 -inch** gypsum board
 12. **24 -inches** on center with **5/8 -inch** gypsum board
 13. Other items such as wood, sheet metal, or plastic panels should be screwed to comply with deflection limit equivalent to that of the ceiling installation.
 14. Use channel molding or angle molding to interface with Drywall Grid System to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.
 15. To suspend a second ceiling beneath a new or existing drywall ceiling, without breaching the integrity of the upper ceiling, use the Drywall Clip.
 - a. To form a transition from a drywall ceiling to an acoustical ceiling, use the Drywall Transition Clips spaced as required for expected loads.

16. For light fixtures (Type G, Type F) use secondary framing cross tees as required to frame opening.
 17. Single cross tees in a route hole to be secured by 7/16 -inch framing screw or alternative methods.
- B. Interior Applications:
1. Install main beams and cross tees at the on center spacing required for ceiling loading, and location of in-ceiling services.
 2. Additional bracing as required by code.
- C. Radius Applications:
1. Determine the bow or camber (Convex or Concave) in a main runner.
 2. Establish a jig or pattern on a flat surface; mark locations to cut main beam; and use four pan head screws to fasten a Radius Clip (RC2) flat to the web between the bulb and the flange, per the manufacturer's instructions.
 3. Install main beams with on center spacing and wire spacing, as needed, to support expected ceiling load.
 4. Additional bracing may be required by code.
 5. Install cross tees at on center spacing as specified by the manufacturer.

- END OF SECTION -

- SECTION 09 2236 -**METAL LATH & ACCESSORIES**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section describes the requirements for furnishing and installing metal lath and accessories on both horizontal and vertical surfaces.
 - 1. Exterior acrylic modified portland cement plasterwork on metal lath plaster bases.
 - 2. Exterior scratch and brown coats for cast stone, adhered brick veneer masonry, ceramic tile substrate and as specified in other sections.
 - 3. Interior brown and scratch coat for ceramic tile substrate.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 06 1600 "Sheathing" for sheathing
- D. Section 04 2115 "Adhered (Thin) Brick Masonry" for thin brick installed over metal lath plaster base.
- E. Section 04 7300 "Manufacturer Stone Masonry" for simulated stone installed over metal lath plaster base.
- F. Section 07 2500 "Fluid-Applied Membrane Air Barriers" for water-resistive barrier.
- G. Section 07 6200 "Sheet Metal Flashing & Trim" for metal and PVC flashings at openings to be installed in conjunction with material in this section to prevent water infiltration into the structure.
- H. Section 09 2513 "Acrylic Modified Portland Cement Plastering" for three coat plaster system.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM C 926 - Standard Specification for Application of Portland Cement-Based Plaster.
- C. ASTM C 1032 - Standard Specification for Woven Wire Plaster Base, 2006.
- D. ASTM C 1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster, 2007.
- E. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc..
- F. PCA EB049 - Portland Cement Plaster/Stucco Manual; Portland Cement Association.
- G. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..
- H. Manufacturer's specifications and recommendations.
- I. NAAMM – ML/SFA 920 Guide Specification for Metal Lathing and Furring

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Samples for Verification: Physical samples of each type of metal lath required, 12 –inches by 12 -inches (305 by 305 mm) and three (3) of each type of fastener, including furring fasteners.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with the applicable requirements of Phoenix Building Construction Code Chapter 25.
- B. Referenced Standards: Comply with the latest editions of the standards referenced in this section, except where more stringent standards are specified or required by the manufacturer.
- C. Perform Work in accordance with PCA Portland Cement Plaster (Stucco) Manual.
 - 1. Maintain one copy on site.

METAL LATH & ACCESSORIES

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver products and materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.
- C. Remove items delivered in broken, damaged, rusted, or unlabeled condition from Project site immediately.
- D. Protect metal lath and accessories from moisture and other sources of damage.
- E. Store metallic materials and accessories indoors, off the floor.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 METAL LATH

- A. Welded Wire-Fabric Lath for Vertical Surfaces: Self-furred galvanized welded wire fabric lath without paper backing for use over solid sheathed vertical surfaces.
 - 1. Basis of Design: **Structa Wire Corporation**; www.structawire.com; **Megalath** (ICC # ESR 2017).
 - 2. Physical Properties:
 - a. Wire Spacing: **1.5 -inch** by **0.7 -inch** rectangular grid.
 - b. Wire Size: 17 gage (**0.054 inch**) Hot-dipped galvanized, low-carbon, cold-drawn steel wire complying with ASTM A641, Class 1.
 - 1) Longitudinal (Horizontal) Wires: Wire flattened to dimensions of **0.034 - inches** by **0.072 -inches** by cold rolling.
 - 2) Cross (Vertical) Wires: Wire having **1/4 -inch** high by **3/8 -inch** long furring crimps spaced 3 -inches on center.
 - c. Welding: Each intersection of longitudinal and cross wires shall be electrical resistance welded.
 - d. Nominal weight of Lath: **1.8 lb/sq. yd.**
- B. Lath for Horizontal Surfaces: Self-furred galvanized welded wire fabric lath with paper backing for use over solid sheathed or open framed vertical surfaces.
 - 1. Basis of Design: **Structa Wire Corporation**; www.structawire.com; V-Truss Wall & Ceiling Rib Lath (ICC # ESR 2017).
 - 2. Physical Properties:
 - a. Wire Spacing: **1.5 -inch** by **0.7 -inch** rectangular grid. 15 "V" shaped trusses designed to span **24 -inches** on center installations, furred **3/8 -inch** deep by **1.9 -inch** center-to-center.

METAL LATH & ACCESSORIES

- b. Wire Size: 17 gage (0.054 -inch) Hot-dipped galvanized, low-carbon, cold-drawn steel wire complying with ASTM A641, Class 1.
 - 1) Longitudinal (Horizontal) Wires: Wire flattened to dimensions of 0.034 inches by 0.064 -inches by cold rolling.
 - 2) Cross (Vertical) Wires: Round Wire 0.034 -inches in diameter having 3/8 -inch high v-shaped furring crimps spaced 1.9 -inches on center.
 - 3) Backing Wires: Round Wire 0.05 -inches in diameter welded in longitudinal direction to the furring crimps.
 - c. Welding: Each intersection of longitudinal, cross and backing wires shall be electrical resistance welded.
 - d. Nominal weight of Lath: 2.2 lb/sq. yd.
 - e. Paper Backing: Perforated kraft paper attached between the primary wires and the backing wires, cut back 2 -inches on each end, wrapped and glued around the outermost backing wire.
- E. Paper Backing: FS UU-B-790, Type I, Grade D, Style 2 vapor-permeable paper.
- 1. Provide paper-backed lath at exterior locations.

2.3 FASTENERS

- A. Fasteners for Metal Lath and Accessories: Nails, staples, or screws of types and sizes required by standards referenced in Phoenix Building Construction Code, Table 2507.2. Nails, staples, or other metal supports conforming to requirements of referenced standards, of type and size to suit application and conditions indicated, galvanized, to rigidly secure lath and associated metal accessories in place.
- 1. Install woven wire metal lath on sheathed stud walls using self furring fasteners.
- B. Furring Fasteners - Metal Stud Framing: Attach metal lath on sheathed metal framed walls using self-furring screw fastener system.
- 1. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; # 8 minimum, with 7/16 -inch #2 Philips truss-head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
 - 2. Furring Seal Screw Fastener System: Consisting of Base unit of high-density polyethylene with cap and plunger, sealant load and a screw, as described in the above paragraph. The sealant is forced out of the base unit by the plunger when impacted by the screw. Base unit shall provide minimum 1/4 -inch furring. Sealant shall be rubber-butyl-rubber based compound.
 - 3. Cardboard furring wads are not acceptable.
 - 4. Water Penetration: ASTM E331 - Pass.
 - 5. Ultra-Violet Light Resistance: Comply with Section 4.1.2 of ICC-ES Acceptance criteria for Water-Resistive barriers (AC38).
 - 6. Product: FastenSeal Self-Sealing Screw Furring Fastener System by Fasten Seal Products LLC, www.fastenseal.com.
 - 7. Substitutions: See Section 01 2500.
- C. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

METAL LATH & ACCESSORIES

- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of not fewer than three exposed threads.
1. General: ASTM C646, corrosion resistant, for attachment to metal framing 25-gauge and lighter; ASTM C954 for attachment to metal framing 20-gauge and heavier.
 2. Thread and head designs and lengths as recommended by manufacturer for uses and materials involved.
- E. Fasteners for Attaching Metal Lath to Concrete Substrates: Complying with ASTM C 1063, Sections 7.10.4 and 7.10.5. Use manufacturer's standard clips and other attachment items for positioning and securing lath.
1. Low velocity power and powder actuated fasteners, ITW Ramset Trakfast or similar, zinc coated fasteners as follows:
 - a. Shank Diameter: 0.109
 - b. Embedment: 3/4-inch, minimum

2.4 METAL ACCESSORIES

- A. Metal Accessories: Provide Alabama Metal Industries Corporation; a Gibraltar Industries company. Substitutions not permitted.
1. J Metal Beads: Fabricated from 26 gauge hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating, 1/2 -inch weep holes in ground flange, no perforations in vertical leg.
 2. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
 3. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
 4. Cornerbeads: X-2 Reinforced Corner Bead fabricated from zinc or zinc-coated (galvanized) steel.
 5. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
 6. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
 7. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
 8. Two-Piece Expansion Joints (story drift): Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 -inch to 5/8 -inch (6.34 to 16 mm) wide; with perforated flanges. Fabricate with 3 -inch minimum vertical legs.
- B. Extruded Aluminum Accessories: Provide Fry Reglet components fabricated from 6063-T5 aluminum alloy and temper, clear anodized finish, with factory applied chromate conversion coating suitable for field applied paint finish. Provide metal shapes used as grounds in sizes shown on plans and as required for plaster thickness.
1. Substitutions not permitted.
 2. Reveals scheduled for painted finish shall be factory finished in color selected by Architect, and protected during installation by PVC channel guard or removable strip.

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3. Provide factory fabricated channel screed connector clips for alignment of intersections and splices.
- C. Sealants: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT Type specified in Section 07 9200.

2.5 WATER-RESISTIVE BARRIER

- A. Water-Resistive Barrier and Accessories: Building paper underlying plaster assemblies is specified in Section 07 2500. This Building paper is in addition to the water-resistive barrier and opening flashings specified in Section 07 2500.

PART 3 - EXECUTION

3.1 INSTALLATION OF METAL LATH

- A. General: Comply with Phoenix Building Construction Code Table 2507.2 and the following:
 1. Install metal lath taut, using self furring fasteners, with long dimension perpendicular to supports, over sheathing and water-resistive barrier at walls and over ceiling framing at soffits, as indicated.
 2. Attach at maximum 6-inch intervals conforming to requirements of ASTM C1063.
 - a. Use wire ties or screws at metal framing and powder driven wide-shouldered forced entry fasteners at solid metal backing. All fasteners shall penetrate into structural support.
 - b. Use furring nails and hook staples at wood framing.
 3. Lap sides not less than **1/2-inch** and ends not less than **1-inch**. Lap wire fabric not less than one mesh at sides and ends or 1-inch, whichever is greater. Lap rib lath at sides by nesting outside ribs. Stagger ends to differing supports and lap.
 4. Where solid backing is not provided, securely tie ends of lapped sheets not occurring over supports with minimum 18-gauge tie wire.
 5. Reinforce internal and external corners with lath.
 - a. Continuously reinforce internal angles with corner mesh, return metal lath 3-inches from corner to form the angle reinforcement; Fasten only at perimeter edges.
 6. Insert lath as far as possible into reentrant space of metal frames, and notch to pass around jamb anchors.
 7. Where no external corner reinforcement is used, furr out lath and extend around corners at least one support on frame construction.

3.2 INSTALLATION OF METAL ACCESSORIES

- A. Expansion and Control Joint Locations: Provide as indicated, and additionally as specified here;
 1. Locations and extents indicated on drawings are the minimum required. If joints shown on the drawings are fewer, recommend joints as specified here and request confirmation of layout by Architect.
 2. Provide additional control joints wherever required to meet the following standards, ensure:

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- a. Maximum distance between joints horizontally or vertically shall not exceed twelve feet on center.
 - b. All cement plaster panels shall be defined by four straight, uninterrupted sides without re-entrant corners. Provide additional joints as required to avoid "inside" corners in any individual panel.
- B. Install according to ASTM C 1063 and at locations indicated on Drawings but not to exceed the following:
 1. Expansion and contraction joints shall be installed in walls not more than 144 sf. ft. (13.4 sq.m.) in area, and not more than 100 sq. ft. (9.3 sq.m.) in area for all non-vertical applications. The distance between joints shall not exceed 18 ft. (5.5 m) in either direction or a length-to-width ratio of 2-1/2 to 1.
- C. General:
 1. Fasten in place as required to prevent dislodging or misalignment by subsequent operations.
 2. Fasten at both ends and at a maximum of 12-inches on center along sides.
 3. Bring grounding edge of accessories to true lines, plumb, level, and straight.
 4. Install accessories to provide required depth of plaster and to bring plaster surface to required plane.
 5. Coordinate, trim or cope screeds and accessories to lap or be lapped with flashings and work provided by other sections. Ensure all laps of accessories, water-resistive barrier and flashings weather to exterior.
 6. Connect lengths of accessories as recommended by the manufacturer to assure a continuous line.
 7. Install continuous corner reinforcement for full length of external corners.
 8. Install casing beads to provide a minimum 1/8-inch clearance between structural units and termination points of surfaces to receive plaster finish.
 9. Extend screeds and accessories into niches and recesses, around interior and exterior wall corners, and around all sides of columns and similar building elements. Continue control joint patterns and molding alignments on walls of arcades, passages and all similar locations to match or extend those shown on exterior elevations, whether or not individual conditions are specifically shown, noted or elevated.
- D. Installation of Lathing Accessories: Set plumb, level, and true to line. Shim where necessary. Miter at corners. Accurately and tightly fit exposed joints. Install sections in as long a length as long as practicable. Fasten by wiring, at not more than 12 -inches (300 mm) on centers. Secure cornerites at 6-inch (150 mm) intervals at edges only (not at corners).
 1. Corner Beads: Install for full length of outside corners, fastened at outer edges only.
 2. Cornerite Reinforcements: Install at inside corners, except where lath is carried around corners at least 3 -inches (75 mm).
 3. Casing Beads: Install for all free edges, wherever plaster abuts against another material, and elsewhere as indicated on Contract Drawings.
 4. Strip Lath: Reinforce corners of openings diagonally with 9-inch (225 mm) by 24-inch (600 mm) strips of metal lath, tied to reinforcement.
 5. Lap and caulk drip screeds and other exterior accessories at joints and intersections.
 6. Place 4-inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

7. Stress Relief Joints: Space joints as indicated on Contract Drawings. Where joints are not indicated, provide joints spaced not more than 20 -feet (6 m) on centers, at intersections of natural breaks in walls and above door frame jambs. Coordinate joint placement to preserve visual alignment with other work acceptable to Architect.
 - a. Cut and separate reinforcement behind expansion and control joints.
 - b. Use double casing bead spaced 1/4-inch (6 mm) apart to form joint.
- E. Beads:
 1. Use single length of metal beads wherever length of run does not exceed longest standard stock length available; miter or cope corners.
 2. Set beads level, plumb, and true to line. Shim as required and align joints with concealed splices or tie plates.
 3. Provide casing beads at the following locations:
 - a. Where plaster abuts dissimilar construction.
- F. At perimeter of openings where edges of plaster will not be concealed by other work.

- END OF SECTION -

- SECTION 09 2513 -**ACRYLIC MODIFIED PORTLAND CEMENT
PLASTERING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Ready mixed exterior portland cement plasterwork (stucco) on metal lath over framing.
 - 2. Exterior scratch and brown coats for:
 - a. Precast Architectural Concrete Specialties
 - b. Adhered (Thin) Brick Veneer
 - c. Exterior Stone Cladding (adhered)
 - d. Exterior Tiling

1.3 RELATED SECTIONS

- A. Section 01 4339 "Mock-up Requirements".
- B. Section 01 4553 "Facade Mockup Testing".
- C. Section 01 8316 "Exterior Enclosure Performance Requirements": Design Loads and Performance Criteria.
- D. Section 03 4510 "Precast Architectural Concrete Specialties" for thin brick installed over metal lath and scratch & brown coat plaster base.
- E. Section 04 4200 "Exterior Stone Cladding (adhered)" for thin brick installed over metal lath and scratch & brown coat plaster base.
- F. Section 04 2115 "Adhered (Thin) Brick Masonry" for thin brick installed over metal lath and scratch & brown coat plaster base.
- G. Section 06 1600 "Sheathing" for sheathing.
- H. Section 07 2419 "Exterior Insulation and Finish System (EIFS)".

- I. Section 07 2500 "Fluid-Applied Membrane Air Barriers".
- J. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal flashing, trim and reglets.
- K. Section 07 9213 "Exterior Facade Sealants" for providing a watertight seal to adjacent materials.
- L. Section 09 2236 "Metal Lath and Accessories": Metal lath and trim for plaster assemblies.
- M. Section 09 2900 "Gypsum Board" for non-structural framing and suspension systems that support lath and portland cement plaster.
- N. Section 09 3053 "Exterior Tiling" for thin brick installed over metal lath and scratch & brown coat plaster base.
- O. Section 04 4200 "Exterior Stone Cladding (adhered)" for thin brick installed over metal lath and scratch & brown coat plaster base.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Concrete Institute ACI 524R: Guide to Portland Cement Plastering
- C. ASTM C 150 - Standard Specification for Portland Cement.
- D. ASTM C 206 - Standard Specification for Finishing Hydrated Lime.
- E. ASTM C 926 - Standard Specification for Application of Portland Cement-Based Plaster.
- F. ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
- G. ASTM C 1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster, 2007.
- H. ICC-ES AC11: Cementitious Exterior Wall Coatings
- I. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc..
- J. Gypsum Association—Fire Resistance Design Manual GA-600, 2009 Edition
- K. PCA EB049 - Portland Cement Plaster/Stucco Manual; Portland Cement Association, 2003.
- L. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- M. Manufacturer's specifications and recommendations.
- N. NAAMM – ML/SFA 920 Guide Specification for Metal Lathing and Furring, 1991
- O. Wall And Ceiling Alliance (WACA), <http://www.wallandceilingalliance.org/>.

ACRYLIC MODIFIED PORTLAND CEMENT PLASTERING

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Demonstrate compliance with specified attributes. Include mix design for each coat.
- B. Shop Drawings: .
 - 1. Location installation and pattern, fully dimensioned, of all control joints, expansion joints, embedments, inserts, penetrations and any other items that will visually affect the plaster surface for all visible portions of the plaster surfaces.
 - 2. Shop drawings shall be to scale and depict all visible surfaces.
 - 3. Include plans, elevations, sections, details of components, and attachments to other work.
 - 4. Location of all element and joints is subject to approval of the Architect.
- C. Sand Compliance Certificates: Submit with each load of sand.
- D. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.
- E. Samples for Verification: For each type of colored textured finish coat indicated; 12 -inches by 12 -inches (305 by 305 mm), and prepared on rigid backing.
- F. Submit Installer qualification data.
- G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Resulting installed materials shall be acceptable to the Authority Having Jurisdiction. Comply with the latest editions of the standards referenced in this section, except where more stringent standards are specified or required by the manufacturer.
- B. Perform Work in accordance with PCA Portland Cement Plaster (Stucco) Manual.
 - 1. Maintain one copy on site.
- C. Fire-Resistance Ratings: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
 - 2. Conform to California Building code for fire rated assemblies as indicated on drawings.
 - 3. Coordinate components of fire rated assemblies with materials specified for support of plaster in other sections.
- D. Sound-Transmission Characteristics: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for STC ratings per ASTM E 90 and classified according to ASTM E 413 by a qualified testing agency.
- E. Manufacturer Qualifications: Manufacturer of Acrylic Modified Portland Cement Plaster shall be the manufacturer of the Exterior Insulation and Finish System specified in Section 07 2419.

- F. Applicator Qualifications: Engage an experienced installer, who is certified, in writing by Plaster System as being qualified to install the plaster systems. The installer shall have ten (10) year's experience with the products to be used on this project and have successfully completed the installation of a minimum of 50,000 square feet of the specified product and employs installers and supervisors who are trained and approved by manufacturer.
1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- G. Pre-installation Meeting: Plan and conduct a pre-installation meeting at the project site after acceptance of all submittals and prior to the installation of any wall materials (including mock-ups).
1. Attendance:
 - a. Architect,
 - b. General Contractor,
 - c. Applicator of the system
 - d. Technical Consultant, supplied by the local distributor.
 - e. Wall And Ceiling Alliance (WACA) Local Representative.

1.7 MOCK-UP

- A. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Within 120 days of mobilization, provide minimum 4 -feet 0 -inches by 12 -feet 0 -inches" by 8 -feet 0 -inches tall onsite mock up, including field area, outside corner, full window opening (with window, head and jamb trim and sill), and representative examples of other design conditions for review and approval by Architect prior to commencing actual work.
 - a. Combine mock-up with that specified for exterior porcelain tile in related section. Show relationships and transitions between materials.
 - b. Demonstrate the proposed range of color, texture and workmanship to be expected in the completed work, including Specialty Finish.
 - c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of mockup approximately 16 -inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit finish above half of flashing).
 - d. Include metal studs, sheathing, flashing in exterior wall mockup.
 - e. Show a cut-away in the panel exposing the water-resistive barriers, metal lath and drainage weep of the system on a perimeter edge of the panel.
 - f. Install plaster over the top of the mockup to duplicate the project plaster parapet, including waterproofing material and parapet cap.
 - g. Include foundation weep screed, corner trim, vertical expansion joint and horizontal control joint.
 - h. Include a sealant-filled joint at least 48 -inches (1600 mm) long in mockup.
 - i. Construct additional panels until finish, color and consistency is approved by Architect.
 - j. Maintain sample panel throughout the construction process and dispose of when project is completed.
 2. Protect accepted mockups from the elements with weather-resistant membrane.

3. Obtain Architect's acceptance of visual qualities of the sample panel. Approval of mockups is for color, texture, tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities Architect specifically approves in writing , including required tests of installed windows, as described in related Sections specifying Windows and Curtain Wall.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - c. Mock-up will also be used for testing of assembly.
4. Mock up or portions of mock up may require more than one iteration and shall be erected in a long term location near the building. Mock-up may not be incorporated into the Work.
5. Approved mockup will form the standard for comparison for Architect's judging aesthetic qualities of the finished work.
6. Construct additional panels until finish, color and consistency is approved by Architect.
7. Maintain sample panel throughout the construction process and dispose of when project is completed.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.9 PROJECT CONDITIONS

- A. Comply with:
 1. ASTM C 926 requirements, and manufacturer instructions.
 2. Plaster and Drywall Systems Manual 3rd Edition, BNI Books, Building News, Inc.
 3. NWCB (Northwest Wall and Ceiling Bureau) Portland Cement Plaster – Stucco Resource Guide.
 4. CBC – California Building Code
- B. The roofing materials shall be loaded onto the roof and interior gypsum wallboard stocked in the building prior to the installation of the Portland cement plaster.
- C. Exterior Plasterwork:
 1. Allow cast-in-place concrete to cure to fully cure at a minimum of 28 days prior to applying base coat or accessories.
 2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C) not to exceed 110 deg F (44.4 deg C). Ambient air temperature must be maintained at a minimum of 40 deg °F (4°C) or higher for at least 24 hours after application to allow proper curing.
 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.
- E. Protection:
 1. Cover building openings in areas adjacent to plastering work with plastic film.

2. Protect finished surfaces installed prior to plastering by covering with a suitable non-staining material. Cover metal frames with plastic film.
3. Maintain protection in place until completion of plastering work.
4. Repair all damage to the building caused by work in this Section. Mark any damage to the work of other trades and report it promptly to the Architect / Engineer and General Contractor for repair. Coordinate protection with other trades and the Owner as required so that no gaps in coverage exist.
5. Protect all incomplete and exposed areas of the building from the effects of inclement weather at the end of every work day. The building must be maintained in a watertight condition and all interior finishes must be kept dry throughout the duration of the Work. Do not leave the building unprotected from weather overnight.

- F. Architect shall conduct a field review of control joints and reveal placement for approval prior to scratch coat application.

1.10 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace plaster system finishes that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - b. Structural failures including cracking in excess of 3/32 -inch or by PCA standards
 - c. Shrinkage
 - d. Finish coat color fading.
 - e. Failure of system to resist penetration of water.
 - f. Failure of system to resist damage from wind.
 - g. Hairline cracking due to temperature or shrinkage is not considered structural failure.
 2. Sole Source; System Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Design Loads and Performance Criteria: As specified in Section 01 8316.
- D. Expansion Control: Design , and location of expansion and control joints shall be determined by the Architect and as shown on the drawings. If joints are required by the following criteria and are not shown on the drawings, recommend joint locations for the Architect's approval. Do not modify aesthetic effect of joint locations shown on drawings or provide joints not shown on drawings without Architect's written approval. (Delta 01)
1. Expansion Joints: Required at the following locations:

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- a. Where expansion joints occur in the substrate system.
 - b. Where building expansion joints occur.
 - c. At floor lines.
 - d. Where plaster abuts dissimilar materials.
 - e. Where the substrate material changes.
 - f. Where significant structural movement occurs such as changes in roofline, building shape or structural system.
2. Control joints: Horizontal and Vertical, required in accordance with ASTM C 1063 and as indicated on the contract drawings in the following locations:
- a. Corners of openings
 - b. Such that monolithic wall areas do not exceed 13.4 m² (144 ft²)
 - c. Length to width ratios of wall areas shall not exceed 2.5:1.
 - d. Maximum spacing of control joints shall not exceed 5.5 m (18 ft)

2.2 WATER-RESISTIVE BARRIER

- A. Water-Resistive Barrier and Accessories: Building paper underlying plaster assemblies is specified in Section 07 2500. This Building paper is in addition to the water-resistive barrier and opening flashings specified in Section 07 2500.

2.3 METAL LATH

- A. Metal Lath and Accessories specified in Section 09 2236.

2.4 PLASTER MATERIALS

- A. Portland cement plaster products shall meet:
1. ASTM C 1328: Standard Specification for Plastic (Stucco) Cement.
 2. Testing in Table below.

Finish Testing			
Test	Test Method	Criteria	Results ¹
Surface Burning Characteristics	ASTM E 84	ICC and ANSI/EIMA 99-A-2001 Flame Spread <25 Smoke Developed <450	Passed
Flexibility ²	ASTM D 522 Method B	No ICC or ANSI/EIMA Criteria	Passed: 1.5" diameter @ 73 °F
Water Vapor Transmission	ASTM E 96 Procedure B	ICC: Vapor Permeable No ANSI/EIMA Criteria	40 Perms
Accelerated Weathering	ASTM G 154 Cycle 1 (QUV)	ANSI/EIMA 99-A-2001 2000 hours: No deleterious effects ³	5000 hours: No deleterious effects ³
	ASTM G 155 Cycle 1 (Xenon Arc)	ICC: 2000 hours: No deleterious effects ³	2000 hours: No deleterious effects ³

Chalk Rating	ASTM D 4214 after ASTM G 154 Cycle 1	No ICC or ANSI/EIMA Criteria	Chalk rating: 8 after 5000 hours QUV
Instrumentally Measured Color Difference ⁴ (includes yellowing)	ASTM D 2244 CIELAB, 10° Observer after ASTM G 154 Cycle 1	No ICC or ANSI/EIMA Criteria	Color change: 0.51 Delta E after 5000 hours QUV
Freeze-Thaw Resistance	ASTM E 2485 (formerly EIMA 101.01)	ANSI/EIMA 99-A-2001 60 cycles: No deleterious effects ³	90 cycles: No deleterious effects ³
	ASTM E 2485 ICC – ES Proc. (AC212)	ICC: 10 cycles No deleterious effect ³	10 cycles: No deleterious effects ³
Mildew Resistance	ASTM D 3273	ANSI/EIMA 99-A-2001 28 days: No growth	60 days: No growth
Salt Spray Resistance	ASTM B 117	ICC and ANSI/EIMA 99-A-2001 300 hours: No deleterious effects ³	1000 hours: No deleterious effects ³
Water Resistance	ASTM D 2247	ICC and ANSI/EIMA 99-A-2001 14 days: No deleterious effects ³	42 days: No deleterious effects ³
Abrasion Resistance	ASTM D 968 Method A Falling Sand	ANSI/EIMA 99-A-2001 500 liters (528 quarts): No deleterious effects ³	1000 liters (1057 quarts): No deleterious effects ³
	ASTM D 4060 Taber Abrasion (1 kg load)	No ICC or ANSI/EIMA Criteria	1000 cycles: .83 mg mass loss
Adhesion to Concrete	ASTM D 4541	ICC and ANSI/EIMA 99-A-2001: 15 psi minimum	>200 psi
Tensile Bond	ASTM C 297/E 2134 (formerly EIMA 101.03)	ICC and ANSI/EIMA 99-A-2001: 15 psi minimum	>25 psi
<p>1. Testing referenced is based on proprietary: Dryvit Quarzputz Pastel Base.</p> <p>2. Finish applied over aluminum panels, bent on cylindrical mandrels as described in ASTM D 522 Method B. Lower diameter indicates higher flexibility.</p> <p>3. No cracking, checking, rusting, crazing, erosion, blistering, peeling, or delamination when viewed under 5x magnification.</p> <p>4. Delta E is total color difference, including yellowing, lightening, darkening, changes in red, blue, and green color values. Finish exposed to 5,000 hours of QUV prior to evaluating Delta E.</p>			

B. Provide liquid polymers, base coats, finish coat materials, and accessories that are compatible and approved for use by plaster manufacturer.

C. Ready Mixed Plaster: (No Job-Mixed Plasters will be accepted).

1. Basis of Design: Dryvit CCP 4 Plaster, a Premixed, Reinforced and Engineered Portland cement plaster manufactured by Dryvit, <http://www.dryvit.com> with custom specialty finish.

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- a. Provide ready mixed products in minimum 90 lb sacks, supersacks, or delivered on-site in pre-mixed silos.
- 2. Alternate Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BMI 660 by BMI Products, Inc.
 - b. Substitutions: Section 01 2500. Proposed substitutions shall meet all criteria specified in Article PERFORMANCE REQUIREMENTS and QUALITY ASSURANCE.
- D. Comply with the following requirements:
 - 1. All materials must be mixed and applied per the manufacturer's recommendations. Manufacture shall provide written installation instructions that must be reviewed and followed through the installation of the Plaster system materials.
 - 2. Match the finishes indicated by referencing manufacturer's standard designations for these characteristics.
- E. Portland Cement: ASTM C 150, Type I.
- F. Masonry Cement: ASTM C 91, Type N.
- G. Plastic Cement: ASTM C 1328.
- H. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.
- I. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- J. Sand Aggregate: ASTM C 897.
 - 1. Color for Job-Mixed Finish Coats: White.
- K. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
 - 1. Basis of Design: Provide 100 percent acrylic finish manufactured by manufactured by Dryvit, <http://www.dryvit.com> as required to produce custom Specialty Finish.
 - 2. Subject to compliance with requirements, provide one of the following:
 - a. BMI Products; 100% Acrylic Finish
 - 3. Color: As selected by Architect from manufacturer's full range.

2.5 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Base Coat Fiber Reinforcing: Propex Concrete Systems, www.fibermesh.com, "FiberCast 500®"; 100 percent virgin polypropylene, fibers containing no reprocessed olefin materials and specifically manufactured for use as cementitious micro-reinforcement; ASTM C 1116, Type III 4.1.3, performance level 1. and ACI 524R-93. Detergent admixtures or clay to aid in pumping plaster will not be permitted.

- C. Crack Limitation Membrane: Resin coated, open weave, glass fiber mesh treated for compatibility with base coat material; weight: 4.0 oz./square yard (136 g/m) minimum weight.
- D. Bonding Compound: ASTM C 932.
- E. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
- F. Fasteners for Attaching Metal Lath to Substrates: Type specified in Section 09 2236, complying with ASTM C 1063.
- G. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475 -inch (1.21-mm) diameter, unless otherwise indicated.
- H. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool; formaldehyde free.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- I. Sealant: As specified in Section 07 9213 "Exterior Façade Sealants"

2.6 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.
- B. Ready mixed plaster to be mixed per manufacturer instruction. Applied in traditional scratch and brown coat, double-back method of application, or 1 pass on the wall of scratch and brown coat 7/8 -inch thickness per ICC-ES Report ESR 2535, dated May 2011, or similar.
- C. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork for the following: Comply with ASTM C 926 for applications indicated. Dryvit CCP Sanded Base.
 - 1. Plastic Cement Mixes:
- D. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows: Comply with ASTM C 926 for applications indicated.
 - 1. Plastic Cement Mix.
- E. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows: Comply with ASTM C 926 for applications indicated.
 - 1. Portland Cement Mix.
 - 2. Masonry Cement Mix.
 - 3. Plastic Cement Mix.

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- F. Primers: Manufacturer's recommended tintable primer, Dryvit Color Prime™, Color Prime-W™ or Primer with Sand™.
- G. Bonding Agent: Acrylic polymer based bonding agent for portland cement based products to increase shear bond adhesion.
- H. Water: Clean, potable and from domestic source.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine Weather Resistive Barriers to ensure they are free of tears or detrimental damage.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLING METAL LATH

- A. Refer to Section 09 2236 for installing metal lath and accessories.
- B. Coordinate with opening flashings specified in related sections to properly sequence installation to shed water to the exterior.

3.4 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.
- B. Sound Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- C. Sealant: Where required to meet STC ratings for wall assemblies indicated or to keep assemblies watertight and weatherproof, seal joints between edges of plasterwork and abutting construction with appropriate sealant specified in related section. Do not seal weeps or obstruct weepholes.

3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
1. Do not deviate more than plus or minus 1/4 -inch in 10 -feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
 4. Complete all work in the same plane and panel each day, do not stop short.
 5. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.
- B. Walls; Base-Coach Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 -inch (19-mm) thickness.
1. Ready-Mix portland cement mixes.
- C. Ceilings; Base-Coach Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 1/2 -inch (13 mm) thick.
1. Ready Mixed, Portland cement mixes.
- D. Walls; Base-Coach Mix: Scratch coat for two-coat plasterwork, 3/8 -inch (10 mm) thick on concrete masonry.
1. Ready Mixed, Portland cement mixes.
- E. Plaster Finish Coats: Apply to provide texture finish to match Architect's sample and approved mock-up.
1. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions. Tolerances: Maximum variation from true flatness shall be 3/16-inch in 10 -feet.
 4. Where plaster application will be used as a base for adhesive application of tile and similar finishes, omit finish coat.
- F. Exterior Surface Base-Coach Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 -inch (19 mm) thick: Provide three-coat application over metal lath in accordance with ASTM C926.
1. Apply plaster by hand or machine spray. If machine applied, use only experienced machine applicator foreman and nozzle man. Slump for machine applied plaster shall be between 2-1/2 -inch to 4 -inches at mixer and 2 -inch to 3-1/2 inches at nozzle.
 2. Interrupt plaster coats only at junctions of plaster planes, at openings, or at control joints.
 3. Apply brown coat to scratch coat, bringing out to grounds, flat to true surface, and free of imperfections that would reflect in finish coat.
 4. Reconsolidate brown coat by floating, and roughen to assure bond with finish coat.
 5. Apply finish coat in accordance with manufacturer's instructions and uniformly float to true, even surface.
 6. Nominal Plaster Thickness Measured from Face of Lath, in accordance with ASTM C929, Table 4:

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- a. Vertical & Horizontal Surfaces:
 - 1) Scratch Coat: 3/8-inch, minimum.
 - 2) Brown Coat: 3/8-inch.
 - 3) Finish Coat: 1/8-inch, minimum.

- G. Exterior Surface Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for two-coat substrate plasterwork; 3/4 -inch (19 mm) thick at adhered materials such as; Thin brick, exterior tile, etc: Provide two-coat application over metal lath in accordance with ASTM C926.
 - 1. Apply plaster by hand or machine spray. If machine applied, use only experienced machine applicator foreman and nozzleman.
 - a. Slump for machine applied plaster shall be between 2-1/2 -inch to 4 -inches at mixer and 2 -inch to 3-1/2 inches at nozzle.
 - 2. Interrupt plaster coats only at junctions of plaster planes, at openings, or at control joints.
 - 3. Apply brown coat to scratch coat, bringing out to grounds, flat to true surface, and free of imperfections that would affect liquid applied waterproof membrane installed for adhered cladding.
 - 4. Reconsolidate brown coat by floating, and float out to assure bond with liquid applied waterproof membrane.
 - a. Refer to liquid applied waterproof membrane manufacturer's requirements for appropriate substrate.
 - 1) Refer to, but not limited to;
 - a) Section 04 4200 "Exterior Stone Cladding (adhered)" for thin brick installed over metal lath and scratch & brown coat plaster base.
 - b) Section 04 2115 "Adhered (Thin) Brick Masonry" for thin brick installed over metal lath and scratch & brown coat plaster base.
 - c) Section 09 3053 "Exterior Tiling" for thin brick installed over metal lath and scratch & brown coat plaster base.
 - d) Section 04 4200 "Exterior Stone Cladding (adhered)" for thin brick installed over metal lath and scratch & brown coat plaster base.
 - 5. Apply finish coat in accordance with manufacturer's instructions and uniformly float to true, even surface.
 - 6. Nominal Plaster Thickness Measured from Face of Lath, in accordance with ASTM C929, Table 4:
 - a. Vertical & Horizontal Surfaces:
 - 1) Scratch Coat: 3/8-inch, minimum.
 - 2) Brown Coat: 3/8-inch.

- H. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 -inch (19 mm) thick on concrete.
 - 1. Application of Base Coats on Lath:
 - a. Scratch Coat: Apply scratch coat not less than 3/8 -inch thick from face of supports to crest of scores, completely embedding and forming good key on metal lath. Thoroughly scratch in one direction only and keep at optimum moisture content with fog spray for 48 hours minimum before second coat is applied.
 - b. Brown Coat: Reconsolidate brown coat by only lightly floating after hydration of the cement has commenced and sufficient moisture has evaporated, so that surface sheen has disappeared, but before the base/brown coat has become to rigid to be moved under float.

- c. Using a (Conventional) steel trowel cut back around trim edges approximately **1/16th** of an **inch**, this will allow the finish to level off flush to the trim edges.
 - d. Leave the face of the base coat only slightly rough using a steel trowel to receive finish.
 - e. Maintain the brown coat moist for 48 hours before applying scratch coat. Allow scratch coat to air cure for 7 days before applying acrylic skim coat.
- I. Bonding Compound: Apply on concrete plaster bases.
- J. Two Coat Application on Solid Bases: Provide two-coat application over masonry/concrete surfaces in accordance with ASTM C926.
 - 1. Apply brown/scratch coat, flat to true surface, and free of imperfections that would reflect in finish coat.
 - 2. Maintain the brown coat moist for 48 hours before applying scratch coat. Allow scratch coat to air cure for 7 days before applying acrylic skim coat.
 - 3. Reconsolidate brown coat by floating, and roughen to assure bond with finish coat.
 - 4. Apply finish coat in accordance with manufacturer's instructions and uniformly float to true, even surface.
 - 5. Nominal Plaster Thickness Measured from Face of masonry, in accordance with ASTM C929, Table 4:
 - a. Vertical Surfaces:
 - 1) Brown Coat: **3/8-inch**.
 - 2) Finish Coat: **1/8-inch**, minimum.
 - b. Horizontal Surfaces:
 - 1) Brown Coat: **3/8-inch**.
 - 2) Finish Coat: **1/8-inch**.
- K. In exterior work, scribe contraction joints through entire plaster application at **10 -feet** on center each way.
- L. Curing: Moist cure base coats per CBC Chapter 25 and Table 2512.6.
 - 1. Maintain moist conditions by fine fog spraying.
 - 2. Cure scratch coat for a minimum of 48-hours, and maintain a minimum of 48-hours between application of scratch coat and brown coat.
 - 3. Cure brown coat for a minimum of 48-hours, and maintain a minimum of 7-days between the application of the brown coat and finish coat. Comply with ASTM C 926 otherwise.
 - 4. Protect work from uneven and excessive evaporation during hot, dry weather and from strong blasts of wind.
- M. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.

3.6 PLASTER REPAIRS

- A. Patching: Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

1. Upon completion, point-up plaster around trim and other locations where plaster meets dissimilar materials.
2. Cut out and patch defective and damaged plaster.
3. Cut out and patch stained or discolored finish plaster.
4. Repair or replace work to eliminate blisters, buckles, check cracking dry outs, efflorescence, excessive pinholes, and similar defects.
5. Repair scaffold tie holes to match and blend with adjacent surfaces.
6. Repair or replace work as necessary to comply with visual effects.

3.7 CLEANING

- A. Remove plaster and protective materials from control and expansion joints, perimeter beads, and adjacent surfaces.
- B. Remove stains that would adversely affect subsequent finishes on plaster.
- C. When complete, plaster surfaces shall be flat or uniformly curved, true to plane; and free from scaffold and tool marks, stains, or other damage or defects and shall be uniform in texture and color.

3.8 PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair surfaces stained, marred, or otherwise damaged during plastering.

- END OF SECTION -

- SECTION 09 2900 -

GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. Interior gypsum wall board, including fire retardant, moisture resistant gypsum wall board.
 2. Tile backing panels.
 3. Joint treatment and surface finishes.
 4. Wall and ceiling finishes, to include gypsum board and concrete substrates.
 5. Gypsum board secured to Vertical Room Fan Coil Units
 - a. Refer to Drawings
 - b. Refer to HVAC Drawings and including;
 - 1) Model 42SUB "Furred-in Universal"
 - 2) As listed on HVAC Drawings.
- B. Interior wall and ceiling sheathing at High Performance Acrylic Finishes walls and ceilings indicated and including; (Refer to Section 09 9628)
1. Pool room 404
 - a. Walls shall be ceramic tile finish over gypsum board with same assembly as a shower.
 2. Storage 425
 3. Pool Equipment 414
 4. Open Bar 401
- C. Interior wall and ceiling transition beads, inside corners, outside corners, etc. at High Performance Acrylic Finished walls, ceilings and tile finish walls within the same rooms shall be vinyl type as specified in Section 09 9628.

1.3 RELATED REQUIREMENTS

- A. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"

GYPSUM BOARD

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FINAL FOR CONSTRUCTION

- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Section 05 4000 "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
- D. Section 06 1600 "Sheathing". Glass-Mat Gypsum Wall Sheathing at exterior applications.
- E. Section 07 2100 "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
- F. Section 07 2419 "Exterior Insulation and Finish System (EIFS)" for interior installed EIFS over rigid insulation.
- G. Section 07 8446 "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
- H. Section 09 2216 "Non-Structural Metal Framing" for interior suspension systems.
- I. Section 09 2216.13 "Gypsum Board Shaft-Wall Assemblies"
- J. Section 09 3013 "Tiling" for coordination of tile over the gypsum board and glass-mat, water-resistant backing board.
- K. Section 09 8100 "Acoustical Insulation" for acoustical insulation installed in assemblies that incorporate gypsum board.
- L. Section 09 9123 "Interior Painting" for primers applied to interior gypsum board surfaces.
- M. Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools" for finish system.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute. (replaced SG-971)
- C. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- F. ASTM C 557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

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- G. ASTM C635, Standard Specifications for Metal Suspension Systems.
- H. ASTM C636, Recommended Practice for Installation of Metal Suspension Systems.
- I. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members.
- J. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- K. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board.
- L. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- M. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- N. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- O. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- P. ASTM C 1278/C 1278M - Standard Specification for Fiber-Reinforced Gypsum Panel.
- Q. ASTM C 1280 - Standard Specification for Application of Gypsum Sheathing.
- R. ASTM C 1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.
- S. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board.
- T. ASTM C 1629/C 1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; current edition.
- U. ASTM C 1658/C 1658M - Standard Specification for Glass Mat Gypsum Panels.
- V. ASTM C 1766 - Standard Specification for Factory-Laminated Gypsum Panel Products.
- W. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- X. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- Y. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- Z. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

- AA. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- BB. ASTM E 413 - Classification for Rating Sound Insulation.
- CC. CISCA Ceiling Systems Installation Handbook.
- DD. GA-214 - Recommended Levels of Gypsum Board Finish; Gypsum Association.
- EE. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association.
- FF. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association.
- GG. GA-600 - Fire Resistance Design Manual; Gypsum Association.
- HH. UL 752 – Standard of Safety for Bullet-Resisting Equipment.
- II. AN. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- JJ. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.
- KK. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. Test Reports: For all stud framing products that do not comply with ASTM C 645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
- E. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- F. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch (300-mm-) long length for each trim accessory indicated.
 - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

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1.6 INFORMATIONAL SUBMITTALS

- A. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700.
 - 2. Warranty: Submit specified warranty.

1.7 QUALITY ASSURANCE

- A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
- B. Regulatory Requirements: Conform to Phoenix Building Construction Code for fire rated assemblies as indicated on drawings.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations on concrete and gypsum board substrates.
 - b. Each finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- F. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- C. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

- D. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.9 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
- B. Room Temperatures:
 - 1. For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F.
 - 2. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours prior to application and continuously after until dry.
 - 3. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.
- D. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- E. Suspended Ceiling Systems - General: Coordinate with other work supported by or penetrating through the ceiling, including mechanical and electrical work and partition systems.
 - 1. Mechanical work: Ductwork and piping above system shall be complete and permanent HVAC systems operating.
 - 2. Electrical Work: Installation of conduit above suspension system shall be complete before installation of suspension system.
 - 3. Low Voltage Electrical Work: Installation of plenum rated cabling and conduit above suspension system shall be complete before installation of suspension system.
- F. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not float surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
 - 1. Maximum Moisture Content of Concrete Substrates: When measured with an electronic moisture meter, concrete to 12 percent or less.
 - 2. Verify seam fins and other projections on formed-surface substrates have been removed.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 PANELS, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273.
 - 1. Mold-resistant board is required at all locations.

2.3 INTERIOR GYPSUM BOARD

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include those specified as Basis-Of-Design and those specifically listed for each type as Alternates.
 - 1. CertainTeed Corp, Saint-Gobain. www.certainteed.com.
 - 2. Georgia-Pacific Gypsum LLC. www.gp.com/gypsum
 - 3. National Gypsum Company. www.nationalgypsum.com
 - 4. PABCO Gypsum. www.pabcogypsum.com
 - 5. USG Corporation www.usg.com.
- B. Impact-Resistant Gypsum Board: Type X ASTM C 1629/C 1629M.
 - 1. Application: Single layer.
 - 2. Classification: Hard Body Impact, Level 3 – Category 3 Hard Body (Heavy Duty)
 - 3. Core: Thickness: 5/8 -inch (15.9 mm).
 - 4. Long Edges: Tapered.
 - 5. Fire resistant: Type "X" or equivalent
 - 6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - 7. Impact Resistance: ASTM C°1629/C°1729M (150 ft.-lbs minimum)
 - 8. Facing: Paper

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9. Code:
- a. Including, but not limited to; Phoenix Building Construction Code 2506.1 & 2506.2.
10. Basis of Design:
- a. **Gold Bond Brand Hi-Abuse XP** Gypsum Board, Type X as manufactured by **National Gypsum Company**, alternate available products that may be incorporated into the Work include the following:
- 1) Certain Teed, Air Renew Extreme Impact Resistant Gypsum Board, Type X
 - 2) National Gypsum, Gold Bond® Brand Hi-Impact® XP Gypsum Board
 - 3) USG, SHEETROCK, Mold Tough® VHI Fire® Code, Type X.
- C. Impact-Resistant Gypsum Board: Type X ASTM C 1629/C 1629M,
1. Application: Dual layer.
 2. Classification: Hard Body Impact, Level 2 – Category 2 Moderate Duty
 3. Core: Thickness: **5/8 -inch (15.9 mm).**
 4. Long Edges: Tapered.
 5. Fire resistant: Type “X” or Type C
 6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 7. Impact Resistance: ASTM C°1629/C°1729M
 8. Facing: Paper
 9. Code:

a. Including, but not limited to; Phoenix Building Construction Code 2506.1 & 2506.2.
10. Basis of Design:
- a. **Gold Bond Brand Hi-Abuse XP** Gypsum Board, Type X as manufactured by **National Gypsum Company**, alternate available products that may be incorporated into the Work include the following:
- 1) Certain Teed, Air Renew Extreme Impact Resistant Gypsum Board, Type X
 - 2) National Gypsum, Gold Bond® Brand Hi-Impact® XP Gypsum Board
 - 3) USG, SHEETROCK, Mold Tough® VHI Fire® Code, Type X.
- D. Abuse-Resistant Gypsum Board: Type X ASTM C 1629/C 1629M,
1. Classification: Soft Body Impact, Level 2 – Category 2 Moderate Duty
 2. Core: Thickness: **5/8 -inch (15.9 mm).**
 3. Long Edges: Tapered.
 4. Fire resistant: Type “X” or Type C
 5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 6. Impact Resistance: ASTM C °1629/C°1729M.
 7. Facing: Paper
 8. Basis of Design:

a. National Gypsum: **Gold Bond® Brand Hi-Impact® XP** Gypsum Board as manufactured by **National Gypsum Company**, alternate available products that may be incorporated into the Work include the following:

 - 1) Certain Teed, Air Renew Extreme Abuse Gypsum Board, Type X

b. GP, ToughRock FireGuard x Mold-Guard Abuse Resistant

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- 1) PABCO®, Gypsum PABCO® High ImpactUSG, SHEETROCK, Mold Tough® VHI Fire® Code, Type X.

E. Flexible Gypsum Board: ASTM C°1396/C°1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 -inch (6.4 mm)
2. Long Edges: Tapered.
3. Fire resistant: N/A
4. Basis of Design:
 - a. **SHEETROCK Gypsum Panels, 1/4" Flexible**, as manufactured by **USG**, alternate available products that may be incorporated into the Work include the following:
 - 1) Certain Teed, 1/4" Flex Gypsum Board, ICC ESR-1338
 - 2) GP,ToughRock FlexRoc Gypsum Board, 1/4" Flexible, G-P Gypsum Corporation
 - 3) National Gypsum, Gold Bond Brand High Flex Gypsum Board
 - 4) PABCO®, Gypsum 1/4" Gypsum Wallboard

F. Ceiling Board: ASTM C 1396/C 1396M and ASTM C°1178 or ASTM C°1658. Special sag-resistant gypsum ceiling board.

1. Core - Thickness: 5/8 -inch (15.9 mm)
2. Long Edges: Tapered.
3. Fire resistant: Type "X" or Type C
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
5. Basis of Design:
 - a. **Gold Bond Brand XP® Gypsum Board**, as manufactured by **National Gypsum Company**, alternate available products that may be incorporated into the Work include the following:
 - 1) USG, SHEETROCK® Mold Tough

G. Gypsum Board: ASTM C°1396/C°1396M and ASTM C°1396 with heavy duty paper each side and non combustible core.

1. Thickness: 5/8 -inch (15.9 mm).
2. Long Edges: Tapered.
3. Fire resistant: Type "X" or Type C
4. Basis of Design:
 - a. **ToughRock® Fireguard X™ Gypsum Board** as manufactured by **GP, Georgia Pacific Gypsum LLC**, www.gp.com, alternate available products that may be incorporated into the Work include the following:
 - 1) Certain Teed, Type X Gypsum Board
 - 2) National Gypsum, Gold Bond Brand Fire Shield Gypsum Board
 - 3) PABCO®, Gypsum Flame Curb®
 - 4) USG, Sheetrock Brand FireCode

2.4 SPECIALTY GYPSUM BOARD AND PANELS

- A. Glass-Mat, Mold & Mildew Resistant Interior Wall Panel: ASTM C 1658/C 1658M, C°1396, C°1177 or C°1658. With fiberglass mat laminated to both sides. Specifically designed for interior use.
1. Core: 5/8 -inch (15.9 mm).
 2. Long Edges: Tapered.
 3. Fire resistant: Type "X" or Type C
 4. Facing: Fiberglass
 5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 6. Standards: Enhanced mold & mildew resistant gypsum core wallboard. Conforming to the physical properties of ASTM C°1177, C°1178, C°1178 or C°1658 on Glass mat back. Rating of 10 "No Mold Growth" as tested for 4 weeks according to ASTM D°3273.
 7. Basis Of Design:
 - a. **"DensArmor Plus Interior Guard"** as manufactured by **GP, Georgia Pacific Gypsum LLC**, www.gp.com, alternate available products that may be incorporated into the Work include the following:
 - 1) National Gypsum, Gold Bond Brand eXP Interior Extreme Gypsum Panel
 - 2) USG, Sheetrock Brand®, Glass-Mat Panels, Mold Tough®, Firecode® X

2.5 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Glass faced Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. Core - Thickness: 5/8 -inch (15.9 mm)
 2. Mold Resistance: ASTM D 3273, score of 10.
 3. Fire resistant: Type "X" or Type C
 4. Basis of Design: **DensShield Tile Backer** as manufactured by **GP, Georgia Pacific Gypsum LLC**, www.gp.com., alternate available products that may be incorporated into the Work include the following:
 - a. CertainTeed Corp.; GlasRoc Diamond BackTile Backer (EGRG®)
 - b. National Gypsum., Gold Bond® eXP® Tile Backer
- B. Refer to Section 09 3013 "Tiling" for the tolerance standard for the substrate installation under the large format tiles.

2.6 HIGH PERFORMANCE ACRYLIC FINISH PANELS

- A. Glass-Mat, Water-Resistant Glass faced Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. Core - Thickness: 5/8 -inch (15.9 mm)
 2. Mold Resistance: ASTM D 3273, score of 10.
 3. Fire resistant: Type "X" or Type C
 4. Basis of Design: **DensShield Tile Backer** as manufactured by **GP, Georgia Pacific Gypsum LLC**, www.gp.com., alternate available products that may be incorporated into the Work include the following:

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- a. CertainTeed Corp.; GlasRoc Diamond BackTile Backer (EGRG®)
 - b. National Gypsum., Gold Bond® eXP® Tile Backer
- B. Refer to Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools" for finish system over gypsum sheathing installed under that specification and in compliance with this specification.
- C. Glass-Mat, Water-Resistant Glass faced Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.

2.7 SPECIALTY APPLICATION – FIREPLACE ENCLOSURE

- A. Cementitious Backer Units: ANSI A118.9, ANSI A108.11 and ASTM-C°1325, with manufacturer's standard edges.
- 1. Application: Indoor fireplace enclosure only.
 - 2. Thickness: 5/8 -inch (15.9 mm) unless indicated otherwise.
 - 3. Surface Burning Characteristics: Flame Spread 0 & Smoke Developed 0, ASTM E84
 - 4. Mold Resistance: ASTM G21, No growth. ASTM D 3273, score of 10 as rated according to ASTM D 3274
 - 5. Accessories:
 - a. Backer unit manufacturers approved fiberglass mesh joint tape
 - 6. Basis of Design: **PermaBase Brand Cement Board** as manufactured by **National Gypsum**, available products that may be incorporated into the Work include the following:
 - a. Alternate manufacturers / products:
 - 1) USG, DUROCK Brand Cement Board Next Gen Refer to Section 01 2500

2.8 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Corner beads, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
- 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, or paper-faced galvanized steel sheet.
 - a. At rooms to be finished in accordance with Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools" shall be vinyl material as specified in Section 09 9628.
 - b. At rooms with tile wall finish and ceiling finish in accordance with Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools" shall be vinyl material as specified in Section 09 9628.
 - 2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Cornerbead on outside corners, unless otherwise indicated.
 - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
 - c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.

- d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
 - e. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Basis-of-Design Product: Reveal molding DRM-25-25 and "F" Reveal FDM 625-75 manufactured by Fry Reglet Corp. Alhambra, CA, tel: (800) 237-9773, www.fryreglet.com.
 - 2. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
 - a. Gordon, Inc. www.gordon-inc.com
 - b. Pittcon Industries.
 - 3. Aluminum: Alloy and temper with not less than the strength and durability properties of **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5.
 - 4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
 - 5. Refer to drawings.
- C. Special Shapes:
 - 1. Picture Hanger Moldings: As manufactured by Gordon Incorporated, www.gordon-inc.com . Furnish with 25 hanger clips; black anodized finish.
 - a. Model No. 907-HT-12, with no flanges.
 - b. Model No. 926-HT-12, with one flange.
 - 2. Refer to drawings.

2.9 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
 - 1. Use pressure-sensitive or staple-attached open-weave glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Joint Tape for Tile Backing Panels: Glass-Fiber Mesh tape.
 - 1. Use glass-fiber Mesh tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for tile applications.
- D. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.

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4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- E. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: Glass-Fiber Mesh tape and joint compound as recommended by backing panel manufacturer.
- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
1. Product recommended by USG for application or equivalent

2.10 CONCRETE COVER FINISH MATERIALS

- A. Joint Compound for Interior Concrete Walls and Ceilings:
1. **National Gypsum; Proform Concrete-Cover Compound** as manufactured by **USG Corporation**, www.usg.com, alternate available products that may be incorporated into the Work include the following:
 - a. National Gypsum; Proform Concrete-Cover Compound
 - b. USG Corporation ; Cover Coat Compound

2.11 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated. Types to suit framing substrates indicated. Lengths as required to fully penetrate all attached layers and structural support.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 -inch** to **0.112 -inch** (**0.84 to 2.84 mm**) thick.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."
- F. Thermal Insulation: As specified in Division 7 Section "Thermal Insulation."
- G. Vapor Retarder: As specified in Division 7 Section "Thermal Insulation."

- H. Gypsum Board and Panel Adhesives and primers: Comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24): Adhesives: 50 g/L.
 - 1. Modified contact adhesive: As recommended by the gypsum board manufacturer and having a placement time before setting of at least 15 minutes.
 - 2. Joint compound adhesive: As recommended by the gypsum board manufacturer.
 - 3. Adhesive for Attachment to Wood: ASTM C 557.
- I. Sealant: Tile backing panels
 - 1. As specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panel's not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 -inch (1.5 mm)** of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control joints and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
 - 1. Walls:
 - a. Where joints are not shown, provide at a maximum dimension of **30 feet** o.c. for walls in vertical and horizontal directions.
 - 1) Provide shop drawings for control joints for review and approval.
 - 2) Refer to Drawings for deviations from spacing requirements.

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2. Ceilings:

- a. Where joints are not shown, provide at a maximum dimension of **50 feet o.c.** and limit overall square footage of uninterrupted ceiling plane to **2500 square feet.**

- 1) Provide shop drawings for control joints for review and approval.
- 2) Refer to Drawings for deviations from spacing requirements.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

- 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft. (0.7 sq. m)** in area.
- 2. Fit gypsum panels around ducts, pipes, and conduits.
- 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4 -inch to 3/8 -inch (6.4- to 9.5-mm-)** wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide **1/4 -inch to 1/2 -inch (6.4- to 12.7-mm-)** wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, at corrugated steel deck, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

- 1. Install gypsum board panels in full height from floor to ceiling in vertical arrangement over wall framing without horizontal butt joints.
 - a. Multi-layer applications:
 - 1) Install first and second layers of gypsum board panels in full height from floor to ceiling in vertical arrangement over wall framing without horizontal butt joints.
 - 2) Second layer shall have vertical joints staggered in relationship to first layer.

3.3 APPLYING INTERIOR GYPSUM BOARD - SCHEDULE

A. Install interior gypsum board in the following locations: (Unless directed specifically otherwise on Drawings)

- 1. Impact- Resistant board - Type X:
 - a. Walls at Interior of all Stair enclosures, (Stairs No: #1, #2, #3, & #4) and Luggage Storage rooms:
 - 1) Level 2 - Category 2 Moderate Duty for double layer application
 - 2) Level 3 - Category 3 Hard Body (Heavy Duty) for single layer application

2. Flexible Gypsum Board - Type R: Apply in double layer at curved assemblies -Radius of 36 -inch or less.
3. Gypsum Ceiling board- Type X: Horizontal ceiling & soffit surfaces, unless otherwise indicated by room location to be Glass-Mat, Mold & Mildew Resistant Interior Wall Panel board.
4. Gypsum Board, Type X: 5/8 -inch thick - Vertical surfaces typical unless scheduled or indicated otherwise.
5. Glass-Mat, Mold & Mildew Resistant Interior Wall Panel board, Type X: Vertical and horizontal surfaces at the following locations unless receiving tile finish and locations noted to receive water resistant gypsum board:
 - a. Interior face of exterior walls
 - b. Restrooms
 - c. Janitor rooms
 - d. Locker rooms
 - e. Shower rooms
 - f. Kitchens and accessory rooms
 - g. Food preparation rooms / areas
 - h. Plumbing chases
 - i. Roof drain chases
 - j. Behind FRP wall finish material
 - k. Behind Stainless steel wall finish material
 - l. Gypsum board Cladding for Vertical Room Fan Coil Units
 - m. Where water resistant gypsum board is indicated
6. Tile Backing Panels, Type X: All Tile assemblies both walls and ceilings unless indicted or specified to be a mortar bed assembly or listed TCA assembly, See Tile Sections.
7. Glass-Mat, Water-Resistant Glass faced Backing Board, Type X: All locations to receive specialty finish walls and ceilings per Section 09 9628.
8. Cementitious Backer board: Fireplace enclosure.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - c. Acoustical wall assemblies:
 - 1) Install gypsum board panels in full height from floor to ceiling in vertical arrangement over wall framing without horizontal butt joints.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

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C. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
2. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
4. Acoustical wall assemblies:
 - a. Install first and second layers of gypsum board panels in full height from floor to ceiling in vertical arrangement over wall framing without horizontal butt joints.
 - b. Second layer shall have vertical joints staggered in relationship to first layer.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12 -inch (300-mm-) long straight sections at ends of curves and tangent to them.
 - a. Acoustical wall assemblies:
 - 1) Install gypsum board panels in full height from floor to ceiling in vertical arrangement over wall framing without horizontal butt joints.
2. For double-layer construction, fasten base layer to studs with screws 16 -inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 -inches (300 mm) o.c.
 - a. Acoustical wall assemblies:
 - 1) Install first and second layers of gypsum board panels in full height from floor to ceiling in vertical arrangement over wall framing without horizontal butt joints.
 - 2) Second layer shall have vertical joints staggered in relationship to first layer.

E. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:

1. Install water-resistant gypsum backing board panels at wall area to receive ceramic tile, and where indicated.
2. Install gypsum wallboard panels with tapered edges taped and finished to produce a flat surface except at locations indicated to receive water-resistant panels.

F. Gypsum: For gypsum materials with different face materials, make transitions at outside or inside corners typically.

1. Where surface material such as tile, FRP or other surface material is applied over gypsum, then gypsum board face types shall occur just under the surface material to hide transition.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile.
 - 1. Install with **1/4-inch (6.4-mm)** gap where panels abut other construction or penetrations.
 - 2. Install sealant as recommended by tile backer board mfr. setback at joint between tile backing panel and Tubs and/or shower receptor.
 - a. Confirm joint size with tile backer manufacturer.
- B. Areas Not Subject to Wetting:
 - 1. Install gypsum board as Schedule in this specification.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 consistent with lines of building spaces and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Bullnose Bead: Use at outside corners.
 - 2. U-Bead: Use at exposed panel edges.
 - 3. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations shown on the drawings. Provide vent area indicated.
- E. Aluminum Trim: Install in locations indicated on Drawings.

3.6 GYPSUM BOARD SECURED TO VERTICAL ROOM FAN COIL UNITS

- A. **Frame and Finish Unit** - Models have factory enclosures and may be finished with normally accepted wall covering.
 - 1. The units are designed to have gypsum board applied directly to the unit cabinet surface to a maximum combined thickness of **5/8-inch**.
 - 2. Use low-profile sheet metal panhead screws to secure wallboard to unit frame.
 - a. Securing gypsum board to cabinet with adhesive only is not acceptable.
 - 3. Fasteners may penetrate the cabinet no more than **1/2 -inch**.

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4. The fasteners must be located to avoid damage to internal components and wiring in the same manner as anchoring fasteners.
5. Do not apply sheet metal screw or nails where they can penetrate coil, riser pipes, or electrical junction box and raceways.
6. Do not secure wallboard to drain pan edges or to control box enclosure.
 - a. Condensate leaks or electrical shorts may result.
7. Prevent sheetrock dust or other debris from settling on coil fins, motor-blower assembly or other unit interior surfaces.
 - a. Clean all dust and debris to new condition.
 - b. Replace all dirty filters.
8. Finish gypsum board in same manner as typical gypsum board, see FINISH LEVEL SCHEDULE as specified.

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
 1. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to GA-214 and ASTM C 840:
 1. Level 0: No taping, finishing, or accessories required.
 2. Level 1: All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
 3. Level 2: All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 4. Level 3: All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. One additional coat of joint compound shall be applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges and suitable for coating with drywall primer specified in related section.
 5. Level 4: All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of

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- joint compound. All joint compound shall be smooth and free of tool marks and ridges and suitable for coating with drywall primer specified in related section.
6. Level 5: All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.
- a. Primer and its application to surfaces are specified in other Division 9 Sections.
- E. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing:
1. Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
 2. Finish according to manufacturer's written instructions otherwise.
- F. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.
- G. Texture Required: Refer to drawings or as selected by Architect from the following:
1. Orange Peel.
 2. Splatter.
 3. Smooth wall

3.8 TOLERANCES

- A. Maximum Variation of Finished Board Surface from True Flatness:
1. $\frac{1}{8}$ -inch in 10 -feet in any direction.

3.9 FINISHING CONCRETE CEILINGS

- A. Joint Compound for Interior Concrete Ceilings:
1. Prefilling: At holes and damaged surface areas, wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 2. Skim Coat: For final coat of Level 4 finish, use drying-type, concrete cover compound or concrete cover compound product designed for application by airless sprayer and to be used instead of skim coat to produce Level 4 finish.
 3. For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

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3.10 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.11 FINISH LEVEL SCHEDULE

- A. Gypsum Board Finish Schedule: Finish panels to levels indicated below in the following locations:
 - 1. Level 0: Temporary Construction.
 - 2. Level 1: Ceiling plenum areas, concealed areas, and where specifically indicated.
 - 3. Level 2: Panels that are substrate for adhesively applied acoustical tile.
 - 4. Level 3: Where heavy wallcovering is installed.
 - 5. Level 4: Exposed surfaces in finished rooms and areas.
 - a. Level 4: For concrete ceiling surfaces scheduled to receive flat, eggshell or satin interior paint.
 - 6. Level 5: For gypsum board surfaces to receive semi-gloss and gloss interior paint, concrete ceiling surfaces to receive semi-gloss interior paint, surfaces to receive wall coverings and adhesive applied murals, and for walls and ceilings in wet areas to receive semi-gloss and gloss interior paint.
- B. Primers, wall covering and other finishes are specified in other Division 9 Sections.

- END OF SECTION -

- SECTION 09 3013 -**TILING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Floor and Wall Tile and Accessories
 - 2. Crack Suppression/Isolation Membrane
 - 3. Waterproof Membrane
 - 4. Leveling Coat, Mortar, Grouts, and Adhesives
 - 5. Shower Pan Liners
 - 6. Metal edge strips and transition strips
 - 7. Thresholds
 - 8. Full mortar beds for thickset tile applications.
 - 9. Indoor Pool room 404 walls which shall be installed the same as a Shower.
 - 10. Mortar bed for floor tile:
 - a. Kitchen area's.
 - b. Refer to Drawings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3000 "Cast-in-Place Concrete" for monolithic slabs specified for tile substrates.
- C. Section 03 3500 "Concrete Finishing"
- D. Section 06 6113 "Cultured Marble Fabrications" for shower surrounds.
- E. Section 07 2633 "Water Vapor Emission Control Coating"
- F. Section 07 9200 "Joint Sealants"
- G. Section 09 0512 "Concrete Floor Moisture Content and pH Testing"

- H. Section 09 2216 "Non-Structural Metal Framing"
- I. Section 09 2900 "Gypsum Board" for tile backer board material
- J. Section 09 3073 "Ceramic Tiling (Swimming Pools)"
- K. Section 09 6013 "Acoustic Underlayment".
- L. Section 09 6500 "Resilient Flooring" for transition accessories.
- M. Section 09 6800 "Carpeting"
- N. Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools" for specialty finish system applied over ceiling in Swimming Pool room and accessory rooms walls and ceilings.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [Tile Council of North America, Inc. \(TCNA\)](#):
 - 1. "Hand Book for Ceramic Tile Installation"
- C. [American National Standards Institute \(ANSI\)](#)
 - 1. ANSI A108.01
 - 2. A108/A118/A136.1 - "American Standard Specification for the Installation of Ceramic Tile".
 - 3. ANSI A108.1A
 - 4. ANSI A108.1B
 - 5. ANSI A108.1C
 - 6. ANSI A108.02
 - 7. ANSI A108.4
 - 8. A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar.
 - 9. A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy
 - 10. ANSI A108.8
 - 11. ANSI A108.9
 - 12. A108.10 - Specifications for Installation of Grout in Tilework.
 - 13. ANSI A108.11
 - 14. ANSI A108.12
 - 15. ANSI A108.13
 - 16. ANSI A108.14
 - 17. ANSI A108.15
 - 18. ANSI A108.16
 - 19. ANSI A108.17
 - 20. A118 - Latex-Portland Cement Mortar4
 - 21. A118.1 - Dry-Set Portland Cement Mortar

22. A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive
23. A118.4 – “Latex-Portland Cement Mortar”
24. A118.7 – “Polymer Modified Cement Grouts”
25. A118.12 “Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation”
26. A136.1 - Organic Adhesives for Installation of Ceramic Tile
27. A137.1 - Recommended Standard Specifications for Ceramic Tile

D. [ASTM International \(ASTM\)](#) Publications: (Former American Society for Testing and Materials)

1. C241 “Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic”
2. C503 “Standard Specification for Marble Dimension Stone (Exterior)”
3. C627 “Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester”
4. C1028 “Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method”

E. [International Organization for Standards \(ISO\)](#) Publications:

1. ISO 13007-1, “Ceramic tiles -- Grouts and adhesives -- Part 1: Terms, definitions and specifications for adhesives”
2. ISO 13007-2, “Ceramic tiles -- Grouts and adhesives -- Part 2: Test methods for adhesives”
3. ISO 13007-3, “Ceramic tiles -- Grouts and adhesives -- Part 3: Terms, definitions and specifications for grouts”
4. ISO 13007-4, “Ceramic tiles -- Grouts and adhesives -- Part 4: Test methods for grouts”

1.5 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI: American National Standard Specifications for Installation of Ceramic Tile.
- C. Large Format Tiles (LFT): 8-inches by 8-inches or greater tile size.
- D. Wet Area: Includes tile surfaces that are either soaked, saturated, or regularly and frequently subjected to moisture such as tub enclosures, showers, swimming pools, commercial kitchens and exterior areas.
 1. Swimming pool tiling, refer to;
 - a. Section 09 3973 “Ceramic Tiling (Swimming Pools)”

1.6 ACTION SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

- B. Product Data: Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
- C. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- D. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- E. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- F. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- G. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- H. Samples for Verification:
 - 1. Demonstrate uniform texture and color, or a uniform blend within the ranges accepted by the Architect for these characteristics. Fully exhibit color variations within ranges, blend tile in samples to show full range of colors to be provided.
 - 2. Assembled Samples with grouted joints for each type of stone tile and for each finish required, at least **36 -inches (900 mm)** square and mounted on a rigid panel. Use grout of type and in color(s) approved for completed Work.
 - 3. Stone thresholds in **6-inch (150-mm)** lengths.
 - 4. Metal edge strips in **6-inch (150-mm)** lengths.
- I. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.7 QUALITY ASSURANCE

- A. In addition to complying with all pertinent codes and regulations, conform to [ANSI](#) A108/A118/A136.1 – "American Standard Specification for the Installation of Ceramic Tile" and [ISO](#) Classifications for Ceramic Tiles, Grouts and Adhesives.
- B. Source Limitations for Tile: Obtain tile from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Waterproof membrane.
 - 2. Crack isolation membrane.

- 3. Joint sealants.
- 4. Metal edge strips.
- E. Mockups:
 - 1. Architect will select one additional surface to represent ceiling to wall transition at Indoor Pool to address the Air Barrier installed over ceiling sheathing per Section 09 9628 and the Air Barrier / Waterproof membrane installed at wall for Tile finish per this specification.
 - a. Refer to Section 09 9628 "High Performance Acrylic Finishes for Indoor Pools"

1.8 DELIVERY, STORAGE, AND HANDLING:

- A. Comply with requirements of Section 01 6000.
- B. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use in accordance with manufacturer's directions. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.
- C. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- D. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- E. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- F. Store liquid materials in unopened containers and protected from freezing.
- G. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.
- H. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.9 PROJECT CONDITIONS

- A. Substrate shall be prepared to receive new tile in a manner acceptable to the tile manufacturer. Existing flooring and other materials shall be removed and surface prepared to accept new tile.
- B. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.
- C. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence tile installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Install tile and accessories only after other finishing operations, including painting, have been completed.

1.11 EXTRA MATERIALS

- A. Refer to Section 01 7843 "Spare Parts"

1.12 WARRANTY

- A. Comply with provisions of Section 01 7700 "Project Closeout".
- B. Assemblies:
 - 1. Provide single source warranty by setting, grout and liquid applied waterproof / Anti-fracture membrane manufacturer for not less than the following:
 - a. Twenty-five (25) years system warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Static Coefficient of Friction: For tile installed on walkway surfaces, stair treads and landings, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Static Coefficient of Friction
 - a. Standard: ASTM C1028
 - b. Tested value: 0.6 minimum for level surface
 - 2. Wet DCOF (Dynamic Coefficient of Friction)
 - a. Standard: ANSI A137.1-2012, Section 9.6
 - b. Method: DCOF AcuTest method
 - c. Device: BOT-3000
 - 1) Test shall be done using 0.05 percent sodium lauryl sulfate solution.
 - d. Measurement: Dynamic Friction
 - e. Application: Level interior flooring surface
 - f. Tested value: 0.42 or greater

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 FLOOR AND WALL TILE

- A. Avendra, LLC Preferred Manufacturers:
 - 1. None
- B. Approved Manufacturers:
 - 1. Ann Sacks, www.annsacks.com
 - 2. Architectural Ceramics, www.architecturalceramics.com
 - 3. Dal-Tile Corporation (630-789-1479)
 - 4. Pental, www.petalonline.com
 - 5. Stone Source, www.stonesource.com
 - 6. Edimax, www.edimax.it
 - 7. Transceramica, www.transceramica.com
 - 8. Refer to Drawings.
- C. Floor Tile: Refer to Interior Finish Specifications Drawings
- D. Wall Tile: Refer to Interior Finish Specifications Drawings
- E. Tile Base and Accessories: Provide special shapes such as bull-nose edges and other accessories as required, to match wall tile.
 - 1. Provide matching bull-nose tile at all exposed edges.

2.4 MATERIAL , WALL SUBSTRATE – SHEATHING

- A. Refer to Section:
 - 1. 09 2900 “Gypsum Board”

2.5 MANUFACTURERS – INSTALLATION MATERIALS

- A. Basis-of-Design: The design is based on 'single source' products by **Laticrete International**, www.laticrete.com as specified.
 - 1. Alternate Manufacturers: Subject to compliance with requirements including "System Warranty", manufacturers offering 'single source' products that may be incorporated into the Work are:
 - a. Custom Building Products, www.custombuildingproducts.com
 - b. MAPEI Corporation, www.mapei.com
- B. Source Limitations for Setting Materials, Waterproof / Anti-fracture liquid applied membrane, Grouts and Sealant:
 - 1. Obtain ingredients of uniform quality for each component from single manufacturer.

2.6 WATERPROOF CLEAVAGE MEMBRANE – SHEET

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; **0.030-inch (0.76-mm)** nominal thickness.
 - 1. Products: Basis of Design, subject to compliance with requirements, provide the following:
 - a. **Noble Company** (The); **Nobleseal TS**.

2.7 WATERPROOF / ANTI-FRACTURE MEMBRANE / CRACK SUPPRESSION – LIQUID APPLIED

- A. General:
 - 1. For thin set tile applications at walls, floors and ceilings.
 - 2. Manufacturer's standard product that complies with ANSI A118.10.
 - 3. For substrate of walls at Indoor Pool room 404.
- B. Schedule:
 - 1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **Hydroban®**
 - c. Data Sheet: 663.0 and 663.5
 - d. System warranty: 25 years (DS 025.0APD)

2.8 CEMENTITIOUS SELF-LEVELING BED ASSEMBLY MATERIALS

- A. Cementitious based, free flowing underlayment: ASTM F2170
1. Reinforcing: None
 2. Underlayment bed:
 - a. Manufacturer's fast setting polymer fortified cementitious underlayment comprised of selected raw materials, portland cement and graded aggregates to be mixed with potable water.
 - b. Basis of Design:
 - 1) Mfgr: Laticrete International, Inc.
 - 2) Product: **NXT Level Plus**
 - 3) Data Sheet: DS-505.0-0813, TDS 230N & TDS 235N
 - 4) System warranty: 25 years (DS 025.0APD)
 3. Concrete substrate primed:
 - a. Laticrete **NXT™ Primer**

2.9 PRIMER FOR CEMENTITIOUS SELF-LEVELING BED ASSEMBLY MATERIALS

- A. Water based primer:
1. Concrete substrate: Cleaned per manufacturers written recommendations.
 - a. Laticrete: TDS 230N
 2. Underlayment bed:
 - a. Manufacturer's fast setting polymer fortified cementitious underlayment comprised of selected raw materials, portland cement and graded aggregates to be mixed with potable water.
 - b. Basis of Design:
 - 1) Mfgr: Laticrete International, Inc.
 - 2) Product: **NXT™ Primer**
 - 3) Data Sheet: DS-502.0-0813
 - 4) System warranty: 25 years (DS 025.0APD)

2.10 THICK REINFORCED MORTAR BED ASSEMBLY MATERIALS

- A. Avendra, LLC Preferred Manufacturers:
1. None
- B. Approved Manufacturers:
1. Custom Building Products (800-272-8786)
 2. Hydroment (Bostick Findley, Inc.) (800-523-2678)
 3. Laticrete International Inc. (800-243-4788)
 4. Mapei Corp. (800-426-2734)
- C. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
1. Cleavage Membrane:
 - a. Sheet membrane as specified.

2. Reinforcing Wire Fabric:
 - a. Galvanized, welded wire fabric, 2 -inch by 2 -inch (50.8 by 50.8 mm) by 0.062 -inch (1.57 mm) in diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M except for minimum wire size.
3. Mortar Bed:
 - a. Manufacturer's polymer fortified mortar bed comprised of selected raw materials, portland cement and graded aggregates to be mixed with potable water.
 - b. Basis of Design:
 - 1) Mfgr: Laticrete International, Inc.
 - 2) Product: **3701 Fortified Mortar Bed**
 - 3) Data Sheet: 100.0
 - 4) System warranty: 25 years (DS 025.0APD)

2.11 SETTING MATERIAL (WALL ADHESIVE MATERIALS - CERAMIC TILE – MASTIC TYPE)

- A. High strength latex-based, non-flammable adhesive formulated to meet or exceed the requirements of [ANSI](#) A136.1, Type 1 and [ISO](#) 13007 D2TE.
- B. Gypsum Wallboard:
 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. Custom Building Products (800-272-8786)
 - b. Hydroment (Bostick Findley, Inc.) (800-523-2678)
 - c. Laticrete International Inc. (800-243-4788)
 - d. Mapei Corp. (800-426-2734)
 3. Acceptable Products: Refer to Setting and Grout Material Schedule at end of this Section, Part 3.

2.12 GROUT MATERIALS

- A. Latex Portland Cement Grout consisting of mortar with an polymer epoxy additive. Use in conformance with [ANSI](#) A108.5 and [ANSI](#) A108.10 Materials shall conform to [ANSI](#) A118.3 and [ANSI](#) A118.7.
 1. Color as shown on Interior Finish Specifications Drawings.
- B. Avendra, LLC Preferred Manufacturers:
 1. None
- C. Approved Manufacturers:
 1. Laticrete International Inc. (800-243-4788)
 - a. Epoxy Grout (All Joint Widths - Floor and Wall)
 - 1) All areas except Swimming Pool Decks and Prep-Kitchens: "SpectraLOCK Pro Epoxy Grout"
 - 2) Swimming Pool Decks and Prep-Kitchens: "SpectraLOCK 2000 IG"
 - 3) Indoor Swimming Pool walls: "SpectraLOCK 2000 IG"

- 4) Shower walls: "SpectraLOCK 2000 IG"
2. Mapei Corp. (800-426-2734)
 - a. Epoxy Grout (All Joint Widths - Floor and Wall)
 - 1) All areas except Swimming Pool Decks and Prep-Kitchens: "Opticolor"

2.13 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric silicone sealants of base polymer and characteristics indicated below that comply with applicable requirements in Division 7 Section "Joint Sealants."
 1. Single-component, mildew-resistant, neutral-curing silicone sealant.
 2. Single-component, nonsag urethane sealant.
 3. Acrylic sealants not allowed.
 4. Use grout manufactures color matching sealant.
- B. Schedule:
 1. Product: (Basis of Design)
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: LATASIL™
 - c. Data Sheet: 6200.1
 - d. System warranty: 25 years
 - e. Primer: LATASIL 9118 Primer for use with porous stone, submerged, and permanent wet area's.
 2. Refer also to Section 07 9200 for installation and preparation requirements.
- C. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.14 PREFABRICATED SHOWER FLOOR PAN - RIGID

- A. Prefabricated Shower Pan and Curb system for use in locations shown on Drawings shall be one of the following products:
 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. "Tile Ready"; Tile-Redi USA LLC (800-232-6156)
 - b. Laticrete
- B. Prefabricated shower pan and curb system with fully integrated drains shall be one-piece molded polyurethane receptor listed by UL as plastic plumbing fixtures, and in conformance with ASTM F462. Where installed in Accessible Roll-In Showers, conform to ANSI A117.1 and all local codes.
 1. Size: Custom Size and configuration as shown on Drawings.
- C. Provide all required accessories including epoxy setting materials. Provide "Redi Flash" flashing material to waterproof junctions between shower pan and wall board. All as recommended by shower pan manufacturer.

2.15 ACCESSORIES

- A. Edging and Transition Strips for floor tile:
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. Schluter Systems (800-574-8481)
 - b. Ceramic Tool Company, Inc. (800-236-5230)
 - c. Approved Substitution by Marriott International
 3. Miter corners and angles. Install in longest lengths possible with closely fitted and aligned butt joints, and with horizontal leg keyed into the mortar bed. Top edge shall be set flush with finished floor tile. Clean and remove any mortar stains.
 4. Refer to Interior Finish Specifications Drawings for model, material and color.
- B. Basis of Design: The design is based on Schluter System, www.schluter.com (800-574-8481).
1. Profiles:
 - a. SCHIENE: Edge of tile butt edge transition to dissimilar flooring.
 - b. RENO-T: T shape level transition to dissimilar flooring.
 - c. RENO-TK: Sloped transition to thinner flooring such as carpet.
 - d. RENO-U Step down smooth transition with butt edge to thinner flooring.
 - e. RENO-V Adjustable sloped smooth overlapping transition onto thinner flooring.
 - f. DILEX-AHK: **3/8 -inch** Cove shaped profile for inside corner of floor tile to wall tile with preformed exterior and interior corners, connectors and end caps.
 - g. JOLLY: Vertical 90 degree edge protection that buttes into adjacent tile.
 - h. RONDEC-STEP: Horizontal 90 degree exposed **1 1/2 -inch** or **2 1/4 -inch** face edge protection with preformed exterior and interior corners.
 - i. DECO: Edge Trim for flush transition:
 - 1) Carpet to Tile ("TS-1")
 - 2) Refer to Drawings.
 - j. Other Profiles as shown on the drawings.
 2. Color and Material:
 - a. As indicated in Drawings, otherwise as selected by Architect.
 3. Sizes as required to suit tile assemblies.
- C. Carpet to Tile Transition components: (Overlapping)
1. Refer to Section 09 6500

2.16 MISCELLANEOUS MATERIALS

- A. Concrete substrate:
1. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

- B. Protective Coating: Liquid grout-release coating that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with stone, mortar, and grout products; easily removable after grouting is completed without damaging grout or stone tile; and recommended for use as temporary protective coating for stone tile.
 - 1. Floor sealer, complying with "Floor Sealer" Paragraph below, may be used provided it is recommended by manufacturer for use as a grout release.
- C. Cleaner: A neutral cleaner capable of removing soil and residue without harming stone and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: (Non epoxy grouts)
 - 1. Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
- E. Flooring Sealer: Colorless, no-sheen, water-based penetrsating slip and stain-resistant sealer, not affecting color or physical properties of surfaces as recommended by tile manufacturers.
 - 1. Basis of Design:
 - a. **DuPont™ StoneTech® Professional Impregnator Pro® Sealer** as manufactured by **Dupont**, www2.dupont.com as supplied by Laticrete, www.laticrete.com
 - 2. Alternate Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work are:
 - a. Aqua Mix® Sealers Choice® Gold as manufactured by CUSTOM Building Products, www.custombuildingproducts.com
 - b. MAPEI Corporation, www.mapei.com Ultracare™ line of products.
 - c. Miracle, www.miraclesealants.com, Impregnator 511 (Original)

2.17 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.18 THRESHOLDS

- A. Georgia Marble, complying with [ASTM](#) C503 requirements, Grade A, free from cracks, chips, stains, or other defects, uniform in tone and coloring. Minimum abrasive-hardness value of 10 per [ASTM](#) C241. Finish to be fine sand-honed on faces and beveled edges.
- B. Color and size as shown in Interior Finish Specifications Drawings.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Installer must examine the areas and conditions under which flooring and accessories are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, and free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - a. TCNA installation standards require a substrate to meet a maximum variation of **1/4 -inch (6.35 mm)** in **10 -feet (3048 mm)** for both vertical and horizontal thin-bed tile installation.
 - b. Substrate flatness shall not exceed **1/16 -inch (1.58 mm)** deviation in the substrate at the longest dimension of the tile or stone.
 - c. For large format tile the substrate cannot exceed **1/16 -inch (1.58 mm)** of irregularity in flatness in **24 -inch (609.6 mm)**. A substrate that exceeds these standards must be filled with an appropriate self-leveling underlayment or ground to the correct tolerance, not filled with additional mortar.
 - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

- B. Consult Architect if deficiencies exist. Correct deficiencies in accordance with requirements of thin brick veneer manufacturer's written installation instructions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SUBSTRATE TOLERANCE

- A. Flatness: Do not exceed $\pm 1/8$ inch variation in 10 feet, non-cumulative.

3.4 PREPARATION

- A. Prior to laying flooring, vacuum and remove all contaminants from surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.
 - 1. Concrete Subfloors:
 - a. Slab substrates are dry and free of curing compounds, sealers, hardeners, residual adhesives, adhesive removers, and other materials whose presence would interfere with bonding of tile adhesive or mortar and comply with surface finish requirements of ANSI A108.01. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by manufacturer.
 - b. Subfloor Moisture Conditions: Before installing flooring Contractor shall verify that Moisture emission rate of not more than 3 lb/1000 sq. ft./24 hours when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1 and does not exceed the capacity of the specified adhesive or mortar, with subfloor temperatures not less than 55 deg F, or as recommended by manufacturer.
 - 1) Perform tests so that each test area does not exceed 200 square feet, and perform not less than two tests in each installation area with test locations evenly spaced in area.
 - a) Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b) Refer to Section 07 2633 "Water Vapor Emission Control Coating"
 - c. New concrete surfaces shall be broom finished. Overtroweled slabs are not acceptable.
 - 1) Finishes of subfloors comply with tolerances and other requirements specified in Section 03 3000 "Cast-In-Place Concrete" and Section 03 3500 "Concrete Finishing" for slabs receiving flooring.
- B. Apply concrete slab primer for ceramic tile, if recommended by flooring manufacturer, prior to application of adhesive.
 - 1. Apply in compliance with manufacturer's directions.
- C. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- D. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

- E. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.5 TILE INSTALLATION - GENERAL

- A. Acoustic Underlayment: (Interior applications)
 - 1. Refer to Section 09 6013 "Acoustic Underlayment" for underlayment to be installed under tile.
- B. Comply with the [ANSI](#) Standard Installation Specification A108.1 through A108.13 and [TCNA](#)'s "Handbook for Ceramic Tile Installation".
- C. Handle, store, mix, and apply mortar and grout in compliance with manufacturer's instructions.
- D. Extend tile work into recesses and under equipment and fixtures to form a complete covering without interruptions. Terminate work neatly at obstructions, edges, and corners without disruption of pattern, joint alignment, or bridging of Expansion Joints or Control Joints.
- E. Install tile after finishing operations, including painting, have been completed. Moisture content of concrete slabs, building air temperature, and relative humidity must be within limits recommended by the flooring manufacturer.
- F. Expansion Joints: Provide expansion joints, control joints and pressure relieving joints of widths and locations according to [TCNA](#) Handbook Construction No. EJ171, and as approved by Architect. Do not saw cut joints after application.
- G. Lay tile from center marks established from center of area so that tile at opposing edges of the area are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at edge perimeters. Lay tile square to room axis unless otherwise shown.
- H. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged. Cut tile neatly in and around all fixtures. Broken, cracked, chipped, or deformed tile are not acceptable.
- I. Lay tile with grain in tile running in same direction. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items.
- J. Sound tile after setting and replace hollow sounding units.
- K. Grout tile to comply with the requirements of the [ANSI](#) A18.10 tile installation standards:
- L. Large Format Tiles: The use of "glass handling" suction cups is required for flat-setting large format tiles into fresh mortar. If tiles are installed in a condition where one edge of the tile is higher than adjacent tile, giving the finished surface an uneven appearance (lippage), the use of a high speed orbital sander (remove all abrasive/sanding paper before applying vibrating pressure to the tile) applied along the edge of the elevated tile can be effective in vibrating excess mortar out for removal, and lowering the tile into alignment with the adjoining tiles.

- M. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

3.6 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical joints, external corners, and other conspicuous lines, do not exceed **1/8 -inch** in **10 -feet**.
- B. Variation in Level: For horizontal joints and other conspicuous lines, do not exceed **1/4 -inch** in **20 -feet (6 mm in 6 m)**, or **1/2 -inch (12 mm)** maximum.
- C. Variation in Surface Plane of Flooring: Do not exceed **1/8 -inch** in **10 -feet (3 mm in 3 m)** from level or slope indicated when tested with a **10 -foot (3-m)** straightedge.
- D. Variation in Plane between Adjacent Units (Lipping): Do not exceed the following differences between faces of adjacent units as measured from a straightedge parallel to stone tiled surface:
1. Units with Polished Faces: **1/64 -inch (0.4 mm)**.
 2. Units with Honed Faces: **1/32 -inch (0.8 mm)**.
 3. Units with Sand-Rubbed Faces: **1/32 -inch (0.8 mm)**.
 4. Units with Thermal-Finished Faces: Depth of thermal finish or **3/16 -inch (5 mm)**, whichever is less.
 5. Units with Natural-Cleft Faces: Depth of natural-cleft finish or **3/16 -inch (5 mm)**, whichever is less.
- E. Variation in Joint Width: Do not vary joint thickness more than **1/16 -inch (1.6 mm)** or one-fourth of nominal joint width, whichever is less.

3.7 TILE BACKING PANEL INSTALLATION

- A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile and where indicated. Install with **1/4-inch (6.4-mm)** gap where panels abut other construction or penetrations.
1. Refer to Section 09 2900 "Gypsum Board"

3.8 SHOWER FLOOR PAN LINER WATERPROOF MEMBRANE INSTALLATION

- A. Install materials to comply with and [ANSI A108.13](#) and as directed by manufacturer to provide a concealed waterproof membrane. All seams shall be adhered to prevent delamination as specified by manufacturer. Upon completion, test for leaks by plugging the drain and filling with water. Make necessary adjustments to stop all leakage and retest until watertight, before top layers are installed.
1. Do not install tile or setting materials over waterproof membrane until waterproofing has cured and been tested to determine that it is watertight.

3.9 PREFABRICATED SHOWER FLOOR PAN INSTALLATION

- A. Install materials as directed by manufacturer to provide a concealed waterproof system. Upon completion, test for leaks by plugging the drain and filling with water. Make necessary adjustments to stop all leakage and retest until watertight, before finish materials are installed.

3.10 FLOOR TILE INSTALLATION

- A. General: Install tiles designated for floor installations in accordance with [TCNA](#)'s "Handbook for Ceramic Tile Installation."
- B. Full mortar bed applications:
 - 1. Kitchen area's.
 - 2. Refer to Drawings.
- C. Back Buttering: For installations indicated, obtain **100 percent** mortar coverage by complying with applicable special requirements for back buttering of tile in referenced [ANSI](#) A108 series of tile installation standards:
 - 1. Exterior tile floors.
 - 2. Tile floors in wet areas, including showers, tub enclosures, laundries, and swimming pools.
 - 3. Tile floors composed of tiles **8 -inch** by **8 -inch** or larger.
 - 4. Tile floors composed of rib-backed tiles.
- D. Large Format Tiles (LFT) shall be installed in a medium bed of setting material.
- E. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
- F. Metal Edge Strips: Install at locations indicated or at all locations where exposed edge of tile flooring meets carpet, wood, or other flooring, unless otherwise indicated.

3.11 CRACK SUPPRESSION MEMBRANE

- A. Install membrane in strict accordance with manufacturer's specifications and [ANSI](#) A108.17.
- B. Provide width of membrane as recommended by membrane manufacturer, but no less than three (3) times the width of the tile used at all control joints, existing cracks in concrete floor and other locations as required to comply with [TCNA](#)'s "Handbook for Ceramic Tile Installation".

3.12 WALL TILE INSTALLATION

- A. General: Install tiles designated for wall installations in accordance with [TCNA](#)'s "Handbook for Ceramic Tile Installation,"
- B. Back Buttering: For installations indicated, obtain **100 percent** mortar coverage by complying with applicable special requirements for back buttering of tile in referenced [ANSI](#) A108 series of tile installation standards:
 - 1. Exterior tile wall installations.
 - a. Refer to Section 09 3053.

TILING

2. Tile wall installations in wet areas, including;
 - a. Showers
 - b. Indoor Swimming Pool room walls
 - c. Tub enclosures
 - d. Laundries
3. Tile wall installations composed of tiles 8 -inch by 8 -inch or larger.

3.13 GROUTING

- A. Joints shall be packed full and free of all voids or pits, joints shall not be raked. Excess grout shall be cleaned from the surface with water as work progresses. Cleaning shall be done while mortar is fresh and before it hardens on the surface.
- B. Grout shall be installed in accordance with [ANSI](#) A108.10 (A108.6 for epoxy) and the manufacturer's recommended procedures and precautions during application and cleaning.
 1. Tile shall be grouted using latex Portland cement grout unless noted otherwise.
 2. Tile in kitchen and associated adjacent areas shall be grouted using chemical resistant epoxy grout.
 3. Tile in Indoor Pool room 404 and associated adjacent areas shall be grouted using chemical resistant epoxy grout.
- C. Grout Sealer: (Non epoxy type grout)
 1. Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions.
 2. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.14 SEALANTS / SEALING

- A. General:
 1. Refer to Section 09 7200 "Joint Sealants" for preparation and installation.
 - a. Type and product shall be as specified in this section.
- B. All joints between tile and dissimilar materials shall be sealed with sealant, not grout.
- C. All penetrations through tile walls and ceilings shall be sealed watertight with sealant, not grout.
- D. Coordinate with mockup for ceiling to wall transition at Indoor Pool for sealant applications at joints between wall and ceiling and wall and floor for sealant compatibility with dissimilar materials.
 1. Refer to Mockup requirements in Section 09 9628

3.15 ADJUST AND CLEAN

- A. Clean grout and setting material from face of tile while materials are workable. Leave tile face clean and free of all foreign matter.
 1. Remove latex-portland cement grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective work.
- C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed surface.
 1. Protect installed tile work with Kraft paper or other heavy covering during the construction period to prevent damage.
 2. Prohibit all foot and wheel traffic from using tiled floors for at least 3 days, preferably 7 days.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from all tile surfaces.

3.16 SETTING AND GROUT MATERIAL SCHEDULE

		Tile (< 8" x 8")	Large Format Tile (≥ 8" x 8")	Indoor Pool/Spa (< 8" x 8")	Prep Kitchen (< 8" x 8")
A.	<u>Laticrete International</u>				
	Mortar - Floor	"Laticrete 254 Platinum Multipurpose Thinset Mortar"	"Laticrete 255 MultiMax MultiPurpose Thinset Mortar"	"Laticrete 254 Platinum Multipurpose Thinset Mortar"	"Laticrete 254 Platinum Multipurpose Thinset Mortar"
	Adhesive – Gypsum Wall Board	"Laticrete 15 Premium Multi-Mastic Adhesive"	"Laticrete 255 MultiMax MultiPurpose Thinset Mortar"	"Laticrete 254 Platinum Multipurpose Thinset Mortar"	"Laticrete 254 Platinum Multipurpose Thinset Mortar"
	Adhesive – Gypsum Wall Board (LVP)	"Laticrete 255 MultiMax MultiPurpose Thinset Mortar"	"Laticrete 255 MultiMax MultiPurpose"	"Laticrete 254 Platinum Multipurpose Thinset Mortar"	"Laticrete 254 Platinum Multipurpose Thinset Mortar"
	Grout	"Spectra LOCK Pro Epoxy Grout"	"Spectra LOCK Pro Epoxy Grout"	"Spectra LOCK 2000 IG"	"Spectra LOCK 2000 IG"
B.	<u>Mapei Corp.</u>				

		Tile (< 8" x 8")	Large Format Tile (≥ 8" x 8")	Indoor Pool/Spa (< 8" x 8")	Prep Kitchen (< 8" x 8")
	Mortar - Floor	"Ultraflex 3"	"UltraFlex LFT"		
	Adhesive – Gypsum Wall Board	"Type 1 Mastic"	"UltraFlex LFT"		
	Adhesive – Gypsum Wall Board (LVP)	"Ultraflex LFT"			
	Grout	"Opticolor"	"Opticolor"		
C.	<u>Bonsal America</u>				
	Mortar - Floor	"Pro Spec PermaFlex 400"			
	Adhesive – Gypsum Wall Board	"Pro Spec B-4050 Multi-Purpose Adhesive"			
	Adhesive – Gypsum Wall Board (LVP)	"PermaFlex 500 Thinset Mortar"			
	Grout	See Note 1	See Note 1		
D.	<u>Hydroment</u>				
	Mortar - Floor	"Hydroment Flex-A-Lastic/Tile-Mate"			
	Adhesive – Gypsum Wall Board	"Hydroment D2001"			
	Adhesive – Gypsum Wall Board (LVP)	"ReFlex"			
	Grout	See Note 1	See Note 1		
E.	<u>Custom Building Prod</u>				
	Mortar - Floor	"FlexBond Premium Flexible Bonding Mortar"			
	Adhesive – Gypsum Wall Board	"AcrylPro Ceramic Tile Adhesive"			
	Adhesive – Gypsum Wall Board (LVP)	"AcrylPro Ceramic Tile Adhesive"			
	Grout	See Note 1	See Note 1		
F.	<u>TEC</u>				
	Mortar - Floor	"TEC 3N1 Performance Mortar"	"TEC 3N1 Performance Mortar"		
	Adhesive – Gypsum Wall Board	"TEC Double Duty Plus"	"TEC 3N1 Performance Mortar"		
	Adhesive – Gypsum	"TEC Double			

		Tile (< 8" x 8")	Large Format Tile (≥ 8" x 8")	Indoor Pool/Spa (< 8" x 8")	Prep Kitchen (< 8" x 8")
	Wall Board (LVP)	Duty Plus"			
	Grout	See Note 1	See Note 1		
Note 1: Laticrete "Spectra LOCK Pro Grout" and Mapei "Opticolor" are the grout products recommended by Marriott					

3.17 TILE FLOOR INSTALLATION SCHEDULE

A. Interior Floor Installations: Standard tile size (Slab on grade)

1. Description: Concrete Subfloor cementitious acrylic fortified thin set mortar with Waterproofing / Anti-fracture membrane.
2. Tile Installation **TCNA F115**: Tile thin set bonded over liquid applied Waterproof / Anti-fracture membrane over slab on grade concrete.
 - a. Concrete substrate: Cleaned and prepared.
 - b. Liquid applied Waterproof / Anti-Fracture membrane over concrete: (Per manufacturers written recommendations)
 - 1) ANSI A118.10
 - c. Thin-Set acrylic fortified adhesive Mortar: (Per manufacturers written recommendations)
 - 1) ANSI A118.4 & ANSI A118.11
 - d. Grout: (Per manufacturers written recommendations)
 - 1) ANSI A118.3 & ANSI A118.5
 - e. Expansion Joints: TCNA EJ171E
 - f. Acoustic Underlayment: Refer to Section 09 6013

B. Interior Floor Installations: Standard tile size (Above ground concrete floors)

1. Description: Concrete Subfloor, cementitious acrylic fortified thin set mortar with Waterproofing / Anti-fracture membrane.
2. Tile Installation **TCNA F115A**: Tile thin set bonded over liquid applied Waterproof / Anti-fracture membrane.
 - a. Concrete substrate: Cleaned and prepared per primer manufacturers written requirements.
 - b. Liquid applied Waterproof / Anti-Fracture membrane over concrete: (Per manufacturers written recommendations)
 - 1) ANSI A118.10
 - c. Thin-Set acrylic fortified adhesive Mortar: (Per manufacturers written recommendations)
 - 1) ANSI A118.4 & A118.11
 - d. Grout: (Per manufacturers written recommendations)
 - 1) ANSI A118.3 & ANSI A118.5
 - e. Expansion Joints: TCNA EJ171E
 - f. Acoustic Underlayment: Refer to Section 09 6013

C. Interior shower Floor Installations: Standard tile size (Slab on grade and above grade)

1. Description: Unbonded reinforced Mortar Bed over Concrete Subfloor with cementitious acrylic fortified thin set mortar and Waterproofing / Anti-fracture membrane.
2. Tile Installation **TCNA F112**: Tile thin set bonded over unbonded reinforced mortar bed with liquid applied Waterproof / Anti-fracture membrane over concrete.
 - a. Concrete substrate: Cleaned and prepared.
 - b. Liquid applied Waterproof / Anti-Fracture membrane over concrete: (Per manufacturers written recommendations)
 - 1) ANSI A118.10
 - c. Thin-Set acrylic fortified adhesive Mortar: (Per manufacturers written recommendations)
 - 1) ANSI A118.4 & ANSI A118.11
 - d. Grout: (Per manufacturers written recommendations)
 - 1) ANSI A118.3 & ANSI A118.5
 - e. Expansion Joints: TCNA EJ171E
 - f. Acoustic Underlayment: Refer to Section 09 6013

D. Interior Floor Installations: Large format tile (Slab on grade)

1. Description: Cementitious self-leveling underlayment bed over concrete subfloor with Waterproofing / Anti-fracture membrane.
2. Tile Installation **TCNA F205**: Tile bonded over liquid applied Waterproof / Anti-fracture membrane which is applied to un-reinforced cementitious self-leveling underlayment bed bonded to primed concrete. Mortar bed depth minimum $\frac{3}{4}$ -inch minimum to 1 -inch maximum.
 - a. Concrete substrate (SOG): Cleaned and prepared per primer manufacturers written requirements.
 - b. Concrete Primed: (Per manufacturers written recommendations)
 - c. Cementitious self-leveling underlayment bed: (Per manufacturers written recommendations)
 - 1) ASTM F2170
 - 2) ASTM C 1708
 - 3) ASTM C1583
 - d. Liquid applied Waterproof / Anti-Fracture membrane over Mortar bed: (Per manufacturers written recommendations)
 - 1) ANSI A118.10
 - e. Thin-Set acrylic fortified adhesive Mortar: (Per manufacturers written recommendations)
 - 1) ANSI A118.4 & A118.11
 - f. Grout: (Per manufacturers written recommendations)
 - 1) ANSI A118.3
 - g. Expansion Joints: TCNA EJ171E
 - h. Acoustic Underlayment: Refer to Section 09 6013

E. Interior Floor Installations: Large format tile (Above ground concrete floors)

1. Description: Cementitious self-leveling underlayment bed over concrete subfloor with Waterproofing / Anti-fracture membrane.
2. Tile Installation **TCNA F205A**: Tile bonded over liquid applied Waterproof / Anti-fracture membrane which is applied to un-reinforced cementitious self-leveling underlayment bed bonded to primed concrete. Mortar bed depth **3/4 inch**
 - a. Concrete substrate: Cleaned and prepared.
 - b. Concrete Primed: (Per manufacturers written recommendations)
 - c. Cementitious self-leveling underlayment bed: (Per manufacturers written recommendations)
 - 1) ASTM F2170
 - 2) ASTM C 1708
 - 3) ASTM C1583
 - d. Liquid applied Waterproof / Anti-Fracture membrane over Mortar bed: (Per manufacturers written recommendations)
 - 1) ANSI A118.10
 - e. Thin-Set acrylic fortified adhesive Mortar: (Per manufacturers written recommendations)
 - 1) ANSI A118.4 & A118.11
 - f. Grout: (Per manufacturers written recommendations)
 - 1) ANSI A118.3
 - g. Expansion Joints: TCNA EJ171E
 - h. Acoustic Underlayment: Refer to Section 09 6013

3.18 TILE WALL INSTALLATION SCHEDULE

A. Interior Wall Installations,:

1. Type: Metal Studs or Furring (Non wet area's):
2. Tile Installation **TCNA W245**: Thin-set mortar on coated glass-mat, water-resistant gypsum backer board, ANSI A118.3 (Epoxy grout) and ANSI A137.(Ceramic Tile)
 - a. Glass faced gypsum sheathing:
 - 1) ASTM C1178
 - b. Thin-Set adhesive Mortar: Per manufacturers written recommendations.
 - c. Grout: Per manufacturers written recommendations.
 - d. Liquid applied Waterproof / Anti-Fracture membrane over concrete: Per manufacturers written recommendations
 - e. Expansion Joints: TCNA EJ171E

B. Interior Wall Installations,:

1. Type: Metal Studs or Furring (Wet area's):
2. Tile Installation **TCNA W245**: Thin-set mortar on coated glass-mat, water-resistant gypsum backer board, ANSI A118.3 (Epoxy grout) and ANSI A137.(Ceramic Tile)
 - a. Thin-Set adhesive Mortar: Per manufacturers written recommendations.
 - b. Grout: Per manufacturers written recommendations.
 - c. Liquid applied Waterproof / Anti-Fracture membrane over concrete: Per manufacturers written recommendations
 - d. Expansion Joints: TCNA EJ171E
 - e. Tie into waterproofing assembly at shower floor.

C. Thresholds: Install thresholds at termination of floor tile or where exposed edge of tile flooring meets carpet, wood, or other dissimilar flooring material. Threshold finishes flush with top of tile; set in same type of setting bed as abutting field tile unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.19 TILE SHOWER RECEPTOR INSTALLATION SCHEDULE

A. Shower Receptor Installations: (Showers)

1. Type: Concrete Subfloor and reinforced Thick Set Mortar Bed (Unbonded to concrete) with Waterproofing / Anti-fracture membrane:
2. Tile Installation **TCNA B420**: Cement mortar bed (thickset) unbonded to concrete floor over Waterproof Crack Isolation (Cleavage) Sheet Membrane with Waterproof / Anti-fracture membrane over mortar bed at floor ANSI A108.1C. and Waterproof membrane on walls over sheathing (TCNA W245).
 - a. Concrete substrate: Cleaned and prepared.
 - b. Thin-Set acrylic fortified adhesive Mortar: (Per manufacturers written recommendations)
 - 1) ANSI A118.4 & A118.11
 - c. Grout: (Per manufacturers written recommendations)
 - 1) ANSI A118.3
 - d. Liquid applied Waterproof / Anti-Fracture membrane over Mortar bed: (Per manufacturers written recommendations)
 - 1) ANSI A118.10
 - e. Mortar bed over (Shower Pan) Waterproof Crack Isolation (Cleavage) Sheet Membrane over concrete substrate. Per manufacturers written recommendations.
 - 1) ANSI A108.11-4.0-4.3.
 - f. Expansion Joints: TCNA EJ171E

- END OF SECTION -

- SECTION 09 3053 -**EXTERIOR TILING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes Tile Cladding for:
 - 1. Exterior Wall Tiling.
- B. Section Includes Tiling accessories including, but not limited to:
 - 1. Liquid applied Waterproof / Anti-fracture membrane.
 - 2. Setting Materials
 - 3. Grout.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- C. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- D. Section 01 4339 "Mockup Requirements"
- E. Section 01 4553 "Façade Mockup Testing"
- F. Section 04 4200 "Exterior Stone Cladding (Adhered)" for Exterior wall Wainscot Tiling
- G. Section 06 1600 "Sheathing" for exterior wall sheathing as base behind cement plaster.
- H. Section 07 1900 "Water Repellent & Graffiti Resistant Coatings" for water repellent and anti-graffiti coating installed over masonry finish surfaces.
- I. Section 07 9213 "Exterior Façade Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in related exterior façade surfaces.

- J. Section 08 4113 Aluminum Framed Entrances and Storefronts
- K. Section 08 4229 Automatic Entrances
- L. Section 08 4413 Glazed Aluminum Curtain Walls
- M. Section 09 2236 "Metal Lath & Accessories" for metal lath and accessories for scratch and brown coat.
- N. Section 09 2513 "Acrylic Modified Cement Plastering" for portland cement scratch and brown coat and metal lath on exterior wall surfaces as substrates for tile.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- C. American Concrete Institute (ACI)
 - 1. ACI 530-08 Building Code Requirements & Specifications For Masonry Structures and Related Commentaries.
 - a. TMS 402-08/ACI 530-08/ASCE 5-08.
- D. American National Standard Specifications for Installation of Ceramic Stone tile:
 - 1. ANSI A108.01-2.4
 - 2. ANSI A108.01-3.6
 - 3. ANSI A108.1A
 - 4. ANSI A108.1B
 - 5. ANSI A108.2
 - 6. ANSI A108.5
 - 7. ANSI A108.6
 - 8. ANSI A108.10
 - 9. ANSI A108.11
 - 10. ANSI A108.13
 - 11. ANSI A108.17
 - 12. ANSI A118.1
 - 13. ANSI A118.1A
 - 14. ANSI A118.1B
 - 15. ANSI A118.1C
 - 16. ANSI A118.3
 - 17. ANSI A118.4
 - 18. ANSI A118.6
 - 19. ANSI A118.7
 - 20. ANSI A118.9
 - 21. AMSI A118.10

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- 22. ANSI A118.12
- 23. ANSI A137.1
- 24. ANSI A138.1

E. American Society for Testing and Materials (ASTM):

- 1. ASTM C472
- 2. ASTM C482
- 3. ASTM C627
- 4. ASTM C645
- 5. ASTM C920
- 6. ASTM C1178
- 7. ASTM C1193
- 8. ASTM C1278
- 9. ASTM C1325
- 10. ASATM C1396/C1396M
- 11. ASTM D4068
- 12. ASTM D4551
- 13. ASTM F2329
- 14. C482-02(2009) - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste

F. CTIOA Technical Bulletin No. 2010-3-23 "Tile Exterior Shear Bond Strength Testing Report".

G. Tile Council of North America (TCNA) "Handbook for Ceramic, Glass and Stone Tile Installation", 2012 ed.

1.5 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI: American National Standard Specifications for Installation of Ceramic Tile. ANSI A108 Series:
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.
- E. Large format: Square or rectangular tiles greater than 12 -inches nominal on any side.

1.6 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 3300 "Submittal Procedures".
 - 1. Product Data: Submit for all specified products.
 - a. Include all applicable physical and performance data.
 - 2. Samples: Submit 4 samples of thin brick/panel brick veneer units to illustrate color, texture, and size range of each type unit.

3. Manufacturer's detailed installation instructions.
 4. List of projects on which manufacturer has supplied thin brick/panel brick veneer materials.
- B. Shop Drawings: Show locations of each type of tile and tile pattern.
1. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
1. Demonstrate uniform texture and color, or a uniform blend within the ranges accepted by the Architect for these characteristics.
 - a. Fully exhibit color variations within ranges, blend tile in samples to show full range of colors to be provided.
 2. Assembled Samples with grouted joints for each type of tile and for each finish required, at least **36 -inches (900 mm)** square and mounted on a rigid panel.
 - a. Use grout of type and in color(s) approved for completed Work.
- E. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.
- F. Test and Inspection Reports for Field Quality-Control Testing of Structural-Sealant Adhesion:

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Maintenance Data: For dimension stone tile to include in maintenance manuals.

1.8 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700 "Closeout Procedures".
- B. Warranty: Submit specified warranty.

1.9 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile from one source or producer.
 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 1. Liquid applied Waterproof / Anti-fracture membrane.

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2. Thin set mortars
3. Grouts

D. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI including A108.01 for substrates and for preparation by other trades.
2. Attendees should include, but not limited to;
 - a. General Contractor
 - b. Architect
 - c. Owner's representative
 - d. Setting material representative
 - e. Tile installation contractor.

E. Adhered component size limitations:

1. In compliance with building code and meeting the following criteria unless allowed otherwise by authoring having jurisdiction:
 - a. Thickness: Not to exceed 2 5/8 -inch net.
 - b. Face dimension:: Not to exceed 36 -inch net in any face dimension
 - c. Total area: Not to exceed 5 square feet.
 - d. Adhesion: Unit and backing shall have a shear strength of at least 50 psi based on gross unit surface area when tested in accordance with ASTM C482, or shall be adhered in compliance with Article 3.3 C or TMS 602/ACI 530.1/ASCE 6.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.
 1. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store liquid materials in unopened containers and protected from freezing.
- D. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.11 MOCK-UP

- A. Vertical application Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution. Use tile selected by verification samples.
 1. Within 120 days of mobilization, provide minimum 4 -feet by 12 -feet by 8 -feet tall onsite mock up, including field area, outside corner, full window opening (with window, head and jamb trim and sill), and representative examples of other design conditions for review and approval by Architect prior to commencing actual work.
 - a. Include a sealant-filled joint at least 48 -inches (1600 mm) long in mockup.
 - b. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of mockup approximately 16 -inches (400 mm) down from top of mockup, with a 12-

- c. Include metal studs, sheathing, flashing in exterior wall mockup.
 - d. Combine mock-up with that specified for exterior plaster in related section. Show relationships and transitions between materials.
 2. Protect accepted mockups from the elements with weather-resistant membrane.
 3. Approval of mockups is for color, texture, and blending of tile; relationship of mortar and sealant colors to tile colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities Architect specifically approves in writing , including required tests of installed windows, as described in related Sections specifying Windows and Curtain Wall.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - c. Mock-up will also be used for testing of assembly.
 4. Mock up or portions of mock up may require more than one iteration and shall be erected in a long term location near the building. Mock-up may not be incorporated into the Work.
 5. Approved mockup will form the standard for comparison for Architect's judging aesthetic qualities of the finished work.
- B. Horizontal application Mockups: Build mockups to demonstrate aesthetic effects, waterproofing, drainage assembly and set quality standards for materials and execution. Use tile selected by verification samples.
1. When substrates are available and meet requirements, provide minimum 8 -feet by 8 -feet onsite mock up, including waterproofing, drainage board, reinforced mortar bed, tile and grout for review and approval by Architect prior to commencing actual work.
 - a. Include a sealant-filled joint at least 48 -inches (1600 mm) long in mockup.
 2. Approval of mockups is for color, texture, and blending of tile; relationship of mortar and sealant colors to tile colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities Architect specifically approves in writing, including required tests of installed drains.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - c. Mock-up will also be used for testing of assembly.
 3. Mock up or portions of mock up may require more than one iteration and shall be erected in a long term location near the building. Mock-up may not be incorporated into the Work.
 4. Approved mockup will form the standard for comparison for Architect's judging aesthetic qualities of the finished work.

1.12 PROJECT CONDITIONS

- A. Environmental Requirements:
1. Minimum air temperature of 40 degrees F (4 degrees C) prior to, during, and for 48 hours after completion of work unless approved otherwise by setting material manufacturer.
 2. Cold Weather Requirements: IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

- B. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

1.13 SEQUENCING AND SCHEDULING

- A. Sequence tile installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Install tile and accessories only after other finishing operations, including painting, have been completed.
- C. Install tile and accessories only after other finishing operations, including painting, have been completed.

1.14 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to **5 percent** of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to **5 percent** of amount installed for each type, composition, and color indicated.
 - 3. This extra stock shall be in addition to unused product remaining at completion of work, which shall be left for Owner's use, and in addition to product used in construction of mockups.

1.15 WARRANTY

- A. Comply with provisions of Section 01 7700 "Project Closeout".
- B. Assemblies:
 - 1. Provide single source warranty by setting, grout and liquid applied waterproof / Anti-fracture membrane manufacturer for not less than the following:
 - a. Metal framed walls: (15) fifteen years.
 - b. Concrete substrate (CMU, Tilt-up or CIP): (25) twenty-five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Shear bond strength between the backing and the tile shall be a minimum of 50 psi in accordance with
 - 1. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples and approved Mockup.
- D. Obtain tile of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 MANUFACTURERS - TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following :
- B. Basis of Design
 - 1. Subject to compliance with requirements, provide products as indicated on Drawings.
 - a. Subject to compliance with specified performance requirements and provide the named products.
- C. Alternate Manufacturers: Alternate products must be approved by Architect.
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. See Section 01 2500.

2.4 MATERIALS - TILE (S-3) (S-4)

- A. Tile Type : Wall tile or as selected by the Architect.
 - 1. Manufacturer: Refer to drawings
 - 2. Tile Colors: Refer to drawings and as selected by Architect.
 - 3. Pattern: Refer to Drawings.
 - 4. Grout Color: As selected by Architect from manufacturer's full range.
 - 5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes.
 - 6. Large Format Tiles: Large format (greater than 15 -inches) square/rectangular tile set in a running bond/brick joint pattern utilizing tiles with any side greater than 15 -inches, the

offset will be maximum of 1/3 of the tiles longest edge length unless otherwise instructed by manufacturer. Tile to be installed with a minimum 1/8 -inch grout joint for rectified material and a 3/16 -inch grout joint for calibrated (non-rectified) material.

B. Tile Type: Accent Wall Tile.

1. Manufacturer: Refer to drawings
2. Tile Colors: Refer to drawings and as selected by Architect.
3. Pattern: Refer to Drawings.
4. Grout Color: As selected by Architect from manufacturer's full range.
5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes.
6. Large Format Tiles: Large format (greater than 15 -inches) square/rectangular tile set in a running bond/brick joint pattern utilizing tiles with any side greater than 15 -inches, the offset will be maximum of 1/3 of the tiles longest edge length unless otherwise instructed by manufacturer. Tile to be installed with a minimum 1/8 -inch grout joint for rectified material and a 3/16 -inch grout joint for calibrated (non-rectified) material.

C. Pattern: Refer to Drawings.

1. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. As indicated on Drawings and as required to produce conditions shown.

2.5 MATERIAL , SUBSTRATE – SCRATCH AND BROWN COATS

A. Refer to:

1. Section 09 2236 "Metal Lath and Accessories".
2. Section 09 2513 "Acrylic Modified Portland Cement Plastering" for scratch and brown coat (ANSI A108.1A).
 - a. Surface finish as required by Waterproof / Anti-fracture membrane manufacturer.

2.6 MANUFACTURERS – INSTALLATION MATERIALS

A. Basis-of-Design: The design is based on 'single source' products by **Laticrete International**, www.laticrete.com as specified .

1. Alternate Manufacturers: Subject to compliance with requirements including "System Warranty", manufacturers offering 'single source' products that may be incorporated into the Work are:
 - a. Custom Building Products, www.custombuildingproducts.com
 - b. MAPEI Corporation, www.mapei.com

B. Source Limitations for Setting Materials, Waterproof / Anti-fracture liquid applied membrane, Grouts and Sealant:

1. Obtain ingredients of uniform quality for each component from single manufacturer.

2.7 WATERPROOF / ANTI-FRACTURE MEMBRANE – LIQUID APPLIED

- A. General:
1. For thin set thin brick applications.
 2. Manufacturer's standard product that complies with ANSI A118.10.
- B. Schedule:
1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **Hydroban®**
 - c. Data Sheet: 663.0 and 663.5
 - d. System warranty: 15 and 25 years as specified
 2. Horizontal Applications: Roof Deck or Balcony
 - a. Products:
 - 1) Refer to Section 07 1413 "Hot Fluid Applied Rubberized Asphalt Waterproofing"

2.8 SETTING MATERIALS

- A. Thin and Medium-Bed, Polymer fortified and Kevlar reinforced Latex-Portland Cement Mortar which complies with requirements in ANSI A118.4, ANSI A118.11 and ASTM C627.
1. General: Provide product that is approved by manufacturer for application thickness up to **3/4 -inch (19 mm)**.
 2. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **255 Multimax**
 - c. Data sheet: 255.0
 - d. System warranty: 25 years (DS 025.0APD)
 - e. VOC: 0 g/L
 - f. Color: For light colored tile, use White.

2.9 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3.
1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: **Spectralock Pro® Premium**
 - c. Data sheet: 681.0
 - d. System warranty: 25 years (DS 025.0APD)
- B. General:
1. Grout Admixture: Type as recommended by the manufacturer.
 2. Grout Release: Type recommended by the tile manufacturer.
 3. Grout Color: As selected by Architect.
 4. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 deg F (60 deg C)**

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2.10 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of;
- B. Product: Manufacturer's standard chemically curing, single-component, nonsag, neutral 1-Part elastomeric **100 percent** silicone sealants of base polymer and characteristics that comply with applicable requirements in including, but not limited to non-staining:
 - 1. Section 07 9213 "Exterior Façade Joint Sealants" and do not stain tile.
 - a. Primer as recommended by sealant manufacturer.
- C. Colors: Provide custom colors of exposed sealants to match colors of grout in tile adjoining sealed joints as selected by Architect.

2.11 ACCESSORIES

- A. Metal Trim: Extruded Aluminum, alloy 6063 TS, profiles as shown on the drawings.
 - 1. Color anodized finish:
 - a. Two-step impregnated color Class II Architectural **0.40-0.70 mils** (AA-M12C22A33).
 - b. Thickness of anodic coating shall be tested in accord with ASTM B244-97 and sealed to pass modified dye stain test ASTM B136-84(1998).
 - c. Color: As selected by Architect from manufacturer's standard color selection.
 - 2. Make custom miters and intersections with welded corners.
 - 3. Products by Fry Reglet Corporation; www.fryreglet.com.
 - a. Substitutions: Section 01 2500.

2.12 MISCELLANEOUS MATERIALS

- A. Weather Barriers, Building Paper and Flexible Flashing for substrate assembly:
 - 1. As specified in Section 07 2500 "Air and Weather Barriers".
- B. Water Repellent Coating:
 - 1. Applied over adhered and grouted assembly
 - a. Type specified in Section 07 1900 "Water Repellent and Graffiti Resistant Coatings".
- C. Concrete substrate:
 - 1. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- D. Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: (Non epoxy grouts)
 - 1. Refer to Water Repellent and Graffiti Resistant Coatings specification.

2.13 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions and substrates are acceptable and are ready to receive work in accordance with the manufacturers written installation instructions
 - 1. Do not start work in an area until adverse conditions in that area are corrected.
- B. Consult Architect if deficiencies exist. Correct deficiencies in accordance with requirements of thin brick veneer manufacturer's written installation instructions.
- C. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
- D. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 1. Cement Plaster and Concrete Substrate:
 - a. TCNA installation standards require a substrate to meet a maximum variation of **1/4 -inch (6.35 mm)** in **10 -feet (3048 mm)** for both vertical and horizontal thin-bed tile installation.
 - b. Scratch and brown coat shall be smooth in accordance with liquid applied waterproof membrane manufacturers written recommendations prior to proceeding with installation.
 - 2. Substrate flatness shall not exceed **1/16 -inch (1.58 mm)** deviation in the substrate at the longest dimension of the tile.
 - 3. For large format tile the substrate cannot exceed **1/16 -inch (1.58 mm)** of irregularity in flatness in **24 -inch (609.6 mm)**. A substrate that exceeds these standards must be filled with an appropriate self-leveling underlayment or ground to the correct tolerance, not filled with additional mortar.
- E. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
- F. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

EXTERIOR TILING

- G. Verify that concrete substrates for tile floors installed with bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - 1. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - 2. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
- H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SUBSTRATE TOLERANCE

- A. Flatness: Do not exceed **1/8 -inch** +/- variation in **10 -feet**, non-cumulative.

3.3 PREPARATION

- A. Advise installers of other work about specific requirements relating to placement of inserts, flashing reglets, metal anchors, and similar items to be used by stonework installer for anchoring, supporting, and flashing of dimension stonework.
 - 1. Furnish installers of other work with Drawings or templates showing locations of these items.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Protect surrounding area from possible damage during installation work.
- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so units taken from one package show same range of colors as those taken from other packages and match approved Samples.
 - 1. If not factory blended, blend tile at Project site before installing which would include a minimum of three full pallets of product at a time.
- E. For concrete substrates for tile installed with adhesives or thin-set mortar, correct conditions that do not comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
 - a. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- F. Prior to setting, clean adhered tile unit surfaces that have become dirty or stained to remove soil, stains, and foreign materials.
 - 1. Clean units by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water.
 - 2. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives and recommended for this use by manufacturer.
- G. Initiating installation constitutes Installer's acceptance of substrates

3.4 WATERPROOFING / ANTI-FRACTURE MEMBRANE INSTALLATION

- A. Install waterproofing to comply with specified manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Install liquid applied waterproofing to comply with ANSI A108.13, ANSI A108.17 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- C. Do not install thin brick or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 TILE INSTALLATION, GENERAL

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage unless specified otherwise:
 - a. Exterior Wall Tiles.
- B. Large Format Tile: Provide a medium-bed setting mortar for deeper non-shrinking bed of mortar to provide proper support to the tile.
 - 1. Use notched trowel of size recommended by tile manufacturer to achieve 100 percent mortar coverage on back of tile.
 - 2. The use of "glass handling" suction cups is recommended for flat-setting heavy large format tile into fresh mortar.
 - a. These "glass handlers/suction cups" can assist in working large format tiles into the mortar for maximum coverage, but are most effective with smooth, glazed or polished surfaces.
 - 3. If tiles are installed in a condition where one edge of the tile is higher than adjacent tile, giving the finished surface an uneven appearance (lippage), the use of a high speed orbital sander (remove all abrasive/sanding paper before applying vibrating pressure to the tile) applied along the edge of the elevated tile can be effective in vibrating excess mortar out for removal, and lowering the tile into alignment with the adjoining tiles.
 - 4. Where excessive lippage may occur due to excess mortar behind the tile, obtain written direction from tile manufacturer for corrective procedures which not affect appearance of finished surfaces or damage adjacent work.
- C. Wipe backs of tiles with a damp cloth to remove dirt and dust before units are installed.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces.
 - 1. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints.
 - 2. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

EXTERIOR TILING

- E. Jointing: Joints shall match dimension and style as specified, indicated on Drawings, otherwise as directed by Architect.
1. Widths: 3/8 -inch (0.9 cm)
 - a. Unless otherwise indicated on Drawings.
 2. Allow adhesive to set and cure in accordance with the manufacturers instructions for individual tile veneer units.
 3. Install grout to tile joints using a tuck pointing tool, metal tipped mortar bag or a grout setting machine in accordance with the manufacturers written installation instructions.
 4. Fill joints completely with grout.
 5. Remove excess grout; do not allow grout to dry on face of units.
 6. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
 7. Clean and finish joints in accordance with manufacturer's instructions.
- F. Jointing Pattern:
1. Lay tile in running bond pattern and other patterns as indicated on the drawings.
 2. Lay out tile work and center tile fields in both directions in each space or on each wall area.
 3. Lay out tile work to minimize the use of pieces that are less than half of a tile.
 4. Provide uniform joint widths unless otherwise indicated.
 5. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 6. Where adjoining tiles on walls and soffits are specified or indicated to be same size, align joints.
 7. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 8. Large format tile set in a running bond/ brick joint pattern utilizing tiles with any side greater than 15 -inches, the offset shall be maximum of 1/3 of the tiles longest edge length.
- G. Control Joints: Size in accordance with the following for sealant performance, but in no case larger than adjacent mortar joints in exposed tile units.
1. Section 07 9213 "Exterior Façade Sealants"
- H. Extend tile work into recesses to form complete covering without interruptions unless otherwise indicated.
1. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- I. Metal Trim: Install in accord with manufacturer's product data and as follows:
1. Install at corners and intersections. All individual conditions may not be designated. Locations not specifically noted shall be installed similar to conditions indicated.
 2. Anchor trim to framing substrates with mechanical anchors installed at 8 -inches on center.
 3. Joints and fasteners shall be invisible in the installed work.
 4. Allowable tolerances shall match that for the surrounding tile.
- J. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

- K. Edging and Transition Strips for tile: Install per manufacturers recommendations.
- L. Mix tiles to achieve a uniformly random distribution of color shadings and patterns.
- M. Pattern Orientation: For tile varieties with directional pattern, orient pattern as indicated on drawings. If no pattern is shown, request direction from Architect.
 - 1. [Orient stone tiles that have pattern parallel to one side with pattern running in the direction of the longest dimension of the space in which they occur.]
- N. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and stone tile.
 - 1. Do not saw-cut joints after installing stone tiles.
 - 2. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 3. Prepare joints and apply elastomeric sealants to comply with requirements in Division 7 Section "Joint Sealants."
- O. Built-in Work: As work progresses, build in door and window frames, nailing strips, anchor bolts, plates, and other items specified in various sections.
 - 1. Build in items plumb and level.
 - 2. Do not build in organic materials subject to deterioration.

3.6 FIELD QUALITY CONTROL

- A. Architect will observe appearance of installed units; installed masonry surfaces shall be free of imperfections which detract from overall appearance when viewed from a distance of 5 -feet (1.5 m) at 90 degrees normal to surface.
- B. Refer to Section 01 4553 "Façade Mockup Testing"
- C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- D. Test Area: Perform tests on mockups and one bay at least 30 -feet (9.1 m), by one story.
- E. Provide water intrusion mockup testing of portion of tile assembly in conjunction with exterior window wall / curtain wall testing.
 - 1. Refer to Section 01 4553 "Façade Mockup Testing"
- F. Perform the following test on mockups and representative areas.
 - 1. Shear Tests: Perform modified version of ASTM C482 substituting the pure Portland cement paste bond coat with the specified thin-set mortar as described in Tile Exterior Shear Bond Strength Testing Report , CTIOA Technical Bulletin No. 2010-3-23.
 - 2. Test a minimum of six areas on each building facade.
 - 3. Repair installation areas damaged by testing.
- G. The test is destructive. Repair damage caused by testing and failed areas to match adjacent undisturbed work.
- H. Defective Work:

EXTERIOR TILING

1. Exterior Tiling will be considered defective if assemblies do not pass tests and inspections.
 2. Exterior Tiling will be considered defective if, in the opinion of the Architect, assemblies' exhibit poorly blended tile or unacceptable ranges of colors or textures beyond those demonstrated in Verification Samples and Approved Mock-ups.
 3. Replace defective work as directed, at no additional costs.
- I. Prepare test and inspection reports.
 - J. Exterior Roof Deck or Balcony Tile Field Quality-Control Testing: Perform the following test on mockups and representative areas.
 1. Shear Tests: Perform modified version of ASTM C482 substituting the pure Portland cement paste bond coat with the specified thin-set mortar as described in Tile Exterior Shear Bond Strength Testing Report , CTIOA Technical Bulletin No. 2010-3-23.
 2. Test a minimum of six areas on the aggregate are of installations.
 3. Repair installation areas damaged by testing.

3.7 ADJUSTING

- A. Cutting and Fitting: Cut and fit for chases, pipes, conduit, sleeves, and grounds.
 1. Cooperate with other sections of work to provide correct size, shape, and location.

3.8 GROUTING

- A. Joints shall be packed full and free of all voids or pits, joints shall not be raked. Excess grout shall be cleaned from the surface with water as work progresses. Cleaning shall be done while mortar is fresh and before it hardens on the surface.
- B. Epoxy type:
 1. Grout shall be installed in accordance with ANSI A108.3 and A108.6 for epoxy and the manufacturer's recommended procedures and precautions during application and cleaning.
- C. Epoxy Emulsion type:
 1. Grout shall be installed in accordance with ANSI A108.6 and A118.3 for epoxy emulsion type and the manufacturer's recommended procedures and precautions during application and cleaning.

3.9 REPAIR

- A. Remove and replace broken, chipped, stained, or otherwise damaged tile, defective joints, and dimension tile that does not match approved samples and mockups or repair tile work including the following description:
 1. Defective joints.
 2. Stone cladding and joints not matching approved samples and field-constructed mock-up.
 3. Work not complying with other requirements indicated.

3.10 CLEANING AND PROTECTING

- A. Comply with Section 01 7400 "Cleaning and Construction Waste Management".
- B. On completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.
 - 1. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions.
 - a. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned.
 - 2. Protect adjacent surfaces and fixtures from effects of cleaning.
 - 3. Flush surfaces with clean water before and after cleaning.
 - 4. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer.
 - 5. Trap and remove coating to prevent drain clogging.
- C. Protect installed tile work with heavy covering during construction period to prevent staining, damage, and wear.
 - 1. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- D. Use only nonmetallic tools in cleaning operations.
 - 1. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods which could cause damage, discoloration, etching of surfaces or joints.
- E. Unused products: Uncut tile and unopened containers of grout shall be left for the Owner's use.
- F. In-Progress Cleaning: Clean tile as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant and smears as sealant is installed.
- G. Final Cleaning:
 - 1. Clean tile no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes.
 - 2. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

3.11 SEALING

- A. Walls:
 - 1. Refer to Section 07 1900 "Water Repellent & Graffiti Resistant Coatings".

3.12 EXTERIOR WALL TILE INSTALLATION SCHEDULE

- A. Exterior Wall Installation: (Cement Plaster scratch and brown coat)
1. Installation **TCNA W244E** similar: Thin-set fortified mortar over Waterproof / Anti-fracture membrane over previously installed cement plaster scratch and brown coat (not cement backer board) over sheathing and over framing.
 - a. Cement plaster scratch & brown substrate: As specified
 - b. Liquid applied Waterproof / Anti-Fracture membrane over substrate: Per manufacturers written recommendations
 - c. Thin-Set adhesive Mortar: Per manufacturers written recommendations.
 - d. Grout: Per manufacturers written recommendations.
 - e. Expansion Joints: TCNA EJ171E
 - f. Sealer:
 - 1) Refer to Section 07 1900

- END OF SECTION -

- SECTION 09 3073 -

CERAMIC TILING (SWIMMING POOLS)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work in this section. Principal items include
1. This section includes ceramic, mosaic and skid-resistant tile for waterline, depth marking and slope change identification.
 2. Thick and thin set application over shotcrete and concrete substrates.
 3. Frost resistant tile, grout and mortar.
 4. Refer to Tile Council of America (TCA) handbook for assistance in selecting adhesives, mortar beds, grouts, and installation details and methods.
- B. Sections not included in this section:
1. 03 3719 "Pneumatically Placed Concrete (Swimming Pool)"
 2. 07 1413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for building waterproofing prior to additional waterproofing specific to swimming pools
 3. 07 1416 "Cold Fluid-Applied Waterproofing (Swimming Pool)" for additional waterproofing at swimming pools
 4. 09 9723 "Concrete and Masonry Coatings (Swimming Pool)"
 5. 13 1133 "Elevated Swimming Pool"
 6. 13 1146 "Swimming Pool Accessories"
 7. 13 1149 "Swimming Pool Cleaning Equipment"

1.2 SUMMARY

- A. Related Documents: General and Supplementary Conditions of Contract, Division 1 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes:
1. Cleavage membrane and Portland cement mortar bed.
 2. Ceramic tile floor and wall surfacing, installed using thin-set method, with cementitious grouted joints.

1.3 REFERENCES

- A. Tile Council of North America, Inc. (TCNA):
1. "Hand Book for Ceramic Tile Installation"

B. American National Standards Institute (ANSI):

1. A108/A118/A136.1 - "American Standard Specification for the Installation of Ceramic Tile".
2. A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar.
3. A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy
4. A108.10 - Specifications for Installation of Grout in Tile work.
5. A118 - Latex-Portland Cement Mortar
6. A118.1 - Dry-Set Portland Cement Mortar
7. A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive
8. A118.4 - "Latex-Portland Cement Mortar"
9. A118.7 - "Polymer Modified Cement Grouts"
10. A118.12 "Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation"
11. A136.1 - Organic Adhesives for Installation of Ceramic Tile
12. A137.1 - Recommended Standard Specifications for Ceramic Tile.

C. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials):

1. C241 "Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic"
2. C503 "Standard Specification for Marble Dimension Stone (Exterior)"
3. C627 "Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester"
4. C1028 "Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method."

D. International Organization for Standards (ISO) Publications:

1. ISO 13007-1, "Ceramic tiles -- Grouts and adhesives -- Part 1: Terms, definitions and specifications for adhesives"
2. ISO 13007-2, "Ceramic tiles -- Grouts and adhesives -- Part 2: Test methods for adhesives"
3. ISO 13007-3, "Ceramic tiles -- Grouts and adhesives -- Part 3: Terms, definitions and specifications for grouts"
4. ISO 13007-4, "Ceramic tiles -- Grouts and adhesives -- Part 4: Test methods for grouts".

1.4 SUBMITTALS

- A. Submit shop drawings, product data, and samples.
- B. Shop Drawings:
 1. Indicate tile layout, patterns, color arrangement, perimeter conditions, and junctions with dissimilar materials, thresholds, and setting details.
- C. Submit product data, specifications, and instructions for using mortars, adhesives and grouts.

D. Samples:

1. Submit color samples illustrating full color range of each type tile.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain each type and color tile material required from single source.
2. Obtain setting and grouting materials from one manufacturer to ensure compatibility.
3. Furnish up to 10-year guarantee from installation material manufacturer. Guarantee is inclusive of installation materials, finish product, and labor.
4. Obtain elastomeric membrane from same manufacturer as setting material or from manufacturer approved by setting material manufacturer to ensure compatibility.

B. Manufacturer Qualifications:

1. Tile: Minimum five (5) years experience in manufacture of tile products.
2. Setting Materials: Minimum ten (10) years experience in manufacture of setting and grout materials specified.

C. Installer Qualifications: Specializing in tile work having minimum of five (5) years successful documented experience with work comparable to that required for this Project.

D. Certifications:

1. Submit "Master Grade Certificate" for each type of ceramic, quarry, and paver tile in accordance with requirements of ANSI A137.1.
2. Submit manufacturer's certifications that mortars, adhesives, and grouts are suitable for intended use.

E. Conform to ANSI- Recommended Standard Specifications for Ceramic Tile - A137.1.

F. Conform to TCA Ceramic Tile: Installation Handbook.

1.6 FIELD SAMPLES

A. Sample Installation:

1. For final review of each type tile, construct sample panel of approximately three (3) square feet. Install in location as noted on Drawings. Show workmanship of finished work and construction techniques.
2. Approved field samples may not remain as part of Work.

1.7 PRE-INSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this section.

1. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.
2. Meeting agenda includes but is not limited to:
 - a. Surface preparation.
 - b. Tile and installation material compatibility.

1.8 DELIVER, STORAGE, AND HANDLING

- A. Labeling: Comply with ANSI A137.1.
- B. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.
- C. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
- D. Broken, cracked, chipped, stained, or damaged tile will be rejected, whether built-in or not.
- E. Protect mortar and grout materials against moisture, soiling, or staining.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
- B. Do not begin installation until building is completely enclosed and HVAC system is operating and maintaining temperature and humidity conditions consistent with "after occupancy" conditions for minimum of 2 weeks.
- C. Maintain continuous and uniform building temperatures of not less than 50 degrees F during installation.
- D. Ventilate spaces receiving tile in accordance with material manufacturers' instructions.

1.10 EXTRA MATERIALS

- A. At completion of project, deliver to Owner extra stock of materials used on project as follows:
 - 1. One (1) carton of each color of wall tile.
- B. Store in location as directed by Owner.
- C. Ensure materials are boxed and identified by manufacturer, type, and color.

1.11 MAINTENANCE DATA

- A. Submit maintenance data.
- B. Include cleaning methods, cleaning solutions recommended; stain removal methods, and polishes and waxes recommended

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements indicated herein, provide products of one of listed manufacturers.
- B. Ceramic Tile:
 - 1. DalTile Corp
 - 2. Inlays, Inc.

2.2 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.
 - 1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with following requirements:
 - 1. Match Architect's sample.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show same range in colors as those taken from other packages and match-approved samples.
- E. Mounting: Where factory-mounted tile is required, provide back-face or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.
 - 1. Where tile is indicated for installation in swimming pools, on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of uses and has been successfully used on other projects.

2.3 CERAMIC TILE

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of following manufacturers.
 - 1. DalTile
 - 2. Inlays, Inc.

- B. Ceramic Waterline Tile - DalTile
 - 1. Grade: ANSI A137.1; 5.0 to 10.0 percent water absorption.
 - 2. Size: 6 -inch x 6 -inch
 - 3. Color: By Owner
- C. Depth Tile Markers – Inlays
 - 1. Grade: ANSI A137.1; 5.0 to 10.0 percent water absorption.
 - 2. Mosaic Slip-Resistant Tile – Deck Depth Tile.
 - a. 1 inch x 1 inch tile, with 4 inch numbers and 4 inch field installed into "Flamed Granite" coping.
 - 3. Glazed Tile – Waterline Depth Tile.
 - a. 6 inch x 6 inch, Color selection by owner.
 - b. Depth numbers and letters to be water jet cut into tile with 4-inch numbers. Send 6-inch tile to Inlay Inc. for fabrication.
 - 4. Depth Numbers per plan.
- D. Safety Tile Markers
 - 1. Grade: ANSI A137.1; 5.0 to 10.0 percent water absorption
 - 2. No-Diving Tile – Placed on Deck.
 - a. Mosaic Custom round tile by Inlay Inc., Installed into "Flamed Granite" coping.
 - 3. Handicap Tile – Placed in Deck.
 - a. Mosaic Custom round Handicap tile by Inlay Inc., Installed into "Flamed Granite" coping.
 - 4. Design per plan
- E. Step Edge Safety Tile – Inlays
 - 1. Grade: ANSI A137.1; 5.0 to 10.0 percent water absorption.
 - 2. Size: 2 1-4 -inch x 6 –inch
 - 3. Color: Blue; #CPC00021
 - 4. Skid Resistant.

2.4 MORTAR, GROUT, AND ADHESIVE MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of following manufacturers.
 - 1. Laticrete International Inc.
 - 2. Mapei Corporation

2.5 MORTAR MATERIALS – THIN SET BEDS

- A. Approved Manufacturers:
 - 1. Laticrete International Inc..
- B. Bond Coat: Thin Set Mortar with Polymer or Acrylic/latex Additive.
 - 1. Approved Products:
 - a. "Laticrete 254 Platinum Multipurpose Thin Set Mortar".

CERAMIC TILING (SWIMMING POOLS)

2.6 GROUT

- A. Latex Portland Cement Grout consisting of mortar with an acrylic latex or polymer epoxy additive. Use in conformance with [ANSI A108.5](#) and [ANSI A108.10](#). Materials shall conform to [ANSI A118.3](#) and [ANSI A118.7](#).
 - 1. Color as shown on Interior Finish Index.
 - a. Approved product: "Spectra LOCK 2000 IG".

2.7 MIXING MORTAR AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that areas to receive tile installed by thin bed method have wood float finish, are true within 1/4 -inch in 10 -feet- 0 -inch.
- B. Condition of Surfaces to Receive Tile:
 - 1. Firm, dry, clean and free of oily or waxy films, mortar and soil. Grounds, anchors, plugs, hangers, bucks, electrical and mechanical work in or behind tile installed.
- C. Air Temperature and Surfaces in Rooms to Receive Flooring: Between 60 degrees to 90 degrees F unless otherwise recommended by manufacturers of materials being installed.

3.2 PREPARATION

- A. Clean substrates.
- B. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to application of tiles.
- C. Prepare surfaces in strict accordance with instructions of manufacturer whose setting materials or additives are being used.
- D. Acid Based Cleaners: Use not permitted.
- E. Scarify concrete substrates with blast track equipment if necessary to completely remove curing compounds or other substances that would interfere with proper bond of setting materials. Clean and maintain substrate in condition required by setting material manufacturer.

- F. Do not seal substrate unless required by manufacturer.
- G. Prime substrate when required by manufacturer.
- H. Blending: For tile exhibiting color variations within ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

- A. Anti-Fracture Membrane
 - 1. Install anti-fracture membrane over cracks of 1/16 -inch or greater in substrates. Apply 12 -inch wide strip centered on crack. Install in accordance with manufacturer's recommendations.
- B. Waterproofing
 - 1. Install waterproofing in strict compliance with manufacturer's instructions.
- C. Tile Installation, General
 - 1. Comply with the [ANSI](#) Standard Installation Specification A108.1 through A108.13 and [TCNA](#)'s "Handbook for Ceramic Tile Installation.
 - 2. Handle, store, mix, and apply mortar and grout in compliance with manufacturer's instructions.
 - 3. Extend tile work into recesses and under equipment and fixtures to form a complete covering without interruptions. Terminate work neatly at obstructions, edges, and corners without disruption of pattern, joint alignment, or bridging of Expansion Joints or Control Joints.
 - 4. Install tile after finishing operations, including painting, have been completed. Moisture content of concrete slabs, building air temperature, and relative humidity must be within limits recommended by the flooring manufacturer.
 - 5. Expansion Joints: Provide expansion joints, control joints and pressure relieving joints of widths and locations according to [TCNA](#) Handbook Construction No. EJ171, and as approved by Architect. Do not saw cut joints after application.
 - 6. Lay tile from center marks established from center of area so that tile at opposing edges of the area are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at edge perimeters. Lay tile square to room axis unless otherwise shown.
 - 7. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged. Cut tile neatly in and around all fixtures. Broken, cracked, chipped, or deformed tile are not acceptable.
 - 8. Lay tile with grain in tile running in same direction. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items.
 - 9. Sound tile after setting and replace hollow sounding units.
 - 10. Grout tile to comply with the requirements of the [ANSI](#) A18.10 tile installation standards.
- D. Tile Installation on Vertical Surface
 - 1. General: Install tiles designated for Vertical installations in accordance with [TCNA](#)'s "Handbook for Ceramic Tile Installation".

CERAMIC TILING (SWIMMING POOLS)

2. Back Buttering: For installations indicated, obtain 100% mortar coverage by complying with applicable special requirements for back buttering of tile in referenced [ANSI A108](#) series of tile installation standards:
 - a. Tile wall installations in wet areas including swimming pools.

E. Layout

1. Lay out work so that full tile or joint is centered on each wall and no tile of less than half width need be used. Do not interrupt pattern through openings. Lay out tile to minimize cutting and to avoid tile less than half size.
2. For heights stated in feet and inches, use courses of full tile to produce nearest attainable heights without cutting tile.
3. No staggered joints will be permitted.
4. Align joints in tile in both directions.
5. Align joints between floor and base tile.
6. Make joints between sheets of tile exactly same width as joints within sheet.
7. File edges of cut tile smooth and even.
8. Cut and fit tile at penetrations through tile. Do not damage visible surfaces. Carefully grind edges of tile abutting built-in items. Fit tile at outlets, piping and other penetrations so that plates, collars, or covers overlap tile.
9. Extend tile work into recesses and under or behind equipment and fixtures, to form complete covering without interruptions, except as otherwise indicated. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
10. Accurately form intersections and returns.
11. Form internal angles square and external angles square.

F. Thin Set Method, Floors and Walls

1. Apply mortar or adhesive with notched trowel using scraping motion to work material into good contact with surface to be covered. Maintain 90 percent coverage on back of tile and fully bed corners.
2. Apply only as much mortar or adhesive as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.
3. When installing large tiles, ceramics or mosaics, trowel small quantity of mortar or adhesive onto back of each tile or sheet of tiles.
4. Set tiles in place and rub or beat with small beating block.
5. Beat or rap tile to ensure proper bond and also to level surface of tile.
6. Align tile to show uniform joints and allow setting until firm.
7. Clean excess mortar or adhesive from surface of tile with wet cheesecloth (not sponge) while mortar is fresh.
8. Allow face mounted tile to set until firm before removing paper and before grouting.
9. Sound tile after setting. Replace hollow sounding tiles.

G. Grouting

1. Allow tiles to set minimum of 24 hours before grouting.
2. If bonding materials are rapid setting, follow manufacturer's recommendations.
3. Install in accordance with grout manufacturer's recommendations and ANSI A108.10.
4. Pack joints full and free before mortar takes initial set.

5. Clean excess grout from surface with wet cheesecloth as work progresses. Do not use hydra sponges.
6. Cure after grouting by covering with kraft or construction paper for 72 hours.
7. Install sealant in vertical wall joints at interior corners.

3.4 ADJUSTING

- A. Sound tile after setting. Replace hollow sounding units.

3.5 CLEANING

- A. Clean excess mortar from surface with water as work progresses. Perform cleaning while mortar is fresh and before it hardens on surfaces.
- B. Sponge and wash tile diagonally across joints. Polish with clean dry cloth.
- C. Remove grout haze following recommendation of mortar additive manufacturer. Do not use acids for cleaning.

3.6 PROTECTION

- A. Prohibit traffic from floor finish for 72 hours after installation.
- B. Where temporary use of new floors is unavoidable, supply large, flat boards or plywood panels for walkways over kraft paper.
- C. Protect work so that it will be without evidence of damage or use at time of acceptancePR1

- END OF SECTION -

- SECTION 09 5123 -**ACOUSTICAL TILE CEILINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Suspended Metal Grid Systems Complete With Wall Trim.
 - 2. Suspended Fiberglass Grid Systems Complete With Wall Trim.
 - 3. Ceiling Tiles.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Division 9 for other suspended ceiling systems.
- D. Division 21 for fire suppression components including, but not limited to sprinkler heads.
- E. Division 23 for air distribution components including, but not limited to HVAC grilles.
- F. Division 26 Sections for light fixtures.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [ASTM International](#) Publications:
 - 1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
 - 2. C635 "Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings"
 - 3. C636 "Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels"

4. E1264 "Standard Classification for Acoustical Ceiling Products"

- C. United States Department of Agriculture Food Safety and Inspection Service (USDA FSIS) Requirements

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Product Data: Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
- F. Manufacturer's product and maintenance data for each type of ceiling system and accessory.
- G. Samples:
1. Minimum 6 -inch by 6 -inch samples of specified acoustical panel.
 2. 8 -inch long samples of exposed wall molding, trim and suspension system (main runner and cross-tee).

1.6 QUALITY ASSURANCE

- A. Qualifications of Installers:
1. The suspended ceiling Subcontractor shall have a record of successful installations of similar ceilings acceptable to the Architect.
 2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.
- B. In addition to complying with all pertinent codes and regulations, suspension system shall be installed according to [ASTM](#) C636, Installation of Metal Ceiling Suspension System for Acoustical Tile and Lay-in Panels.
- C. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with [ASTM](#) E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect work and materials of all other trades.

1.8 PROJECT CONDITIONS

- A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust-generating activities have terminated, and overhead work is completed, tested, and approved.

1.9 REPLACEMENT STOCK

- A. Refer to Section 01 7843 "Spare Parts".

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 STRUCTURAL EXPOSED SUSPENSION SYSTEM

- A. Avendra, LLC Preferred Manufacturers:
 - 1. Armstrong World Industries, Inc. (888-234-5464)
- B. Approved Manufacturers:
 - 1. System used shall be as shown in Interior Finish Specifications Drawings or approved substitution by:
 - a. Chicago Metallic Corp. (800-323-7164)
 - b. USG Interiors, Inc. (800-950-3839)
 - c. Certain Teed, www.certainteed.com
- C. Type I Grid: (15/16 -inch)
 - 1. Acceptable Products:
 - a. "DX-24 Grid System"; USG Interiors, Inc.
 - b. "Prelude XL 15/16 -inch Exposed Tee System"; Armstrong World Industries, Inc.
 - c. "200 Snap-Grid System"; Chicago Metallic Corp.
 - 2. System used shall be double web, direct hung exposed system.
 - a. General: The systems shall be such that the ceiling panels may be removed without damage; that the main runner and cross runners may be removed and replaced without deforming the runners or disturbing the balance of the grid system.
 - 3. Main Runners

- a. Acceptable Products:
 - 1) "7300 Series" with 1-1/2 -inch ht., 15/16 -inch face, steel; Armstrong World Industries, Inc.
 - 2) "Number DX-24" with 1-1/2 -inch ht., 15/16 -inch face, steel; USG Interiors, Inc.
 - 3) "Number 211" with 1-1/2 -inch ht., 15/16 -inch face, steel; Chicago Metallic Corp.
 - b. The main runner shall have a non-directional bayonet coupling.
 - 4. Cross Runners: Designed to support lay-in lighting fixtures and to receive acoustical tile at sides of fixture opening.
 - a. Acceptable Products:
 - 1) "Number XL-7328/7348 Cross Tee"; Armstrong World Industries, Inc.
 - 2) "DX-216/416 Cross Tee"; USG Interiors, Inc.
 - 3) "Number 226/209 Cross Tee"; Chicago Metallic Corp.
 - 5. Perimeter Wall Angles: Hemmed edge:
 - a. Size: 7/8 -inch by 7/8 -inch., typical
 - 6. Accessories: Provide all accessories needed for proper installation of system.
 - 7. Finish: All exposed surfaces shall be finished white.
- D. Type 2 Grid: (9/16 -inch)
- 1. Acceptable Products:
 - a. Certain Teed, 9/16 -inch Elite Narrow Stab, www.certainteed.com
 - b. "Fineline DXF Grid System"; USG Interiors, Inc.
 - c. "Supra-Fine XL 7500 Series Grid System"; Armstrong World Industries, Inc.
 - d. "Ultraline 3500 Grid System"; Chicago Metallic Corp..
 - 2. System used shall be double web, direct hung exposed system, aluminum tee with painted aluminum cap.
 - a. General: The systems shall be such that the ceiling panels may be removed without damage; that the main runner and cross runners may be removed and replaced without deforming the runners or disturbing the balance of the grid system.
 - 3. Main Runners:
 - a. Acceptable Products:
 - 1) "ES12-12-18 with 1-1/2 -inch ht., 9/16 -inch face, steel; Certain Teed.
 - 2) "7500 Series" with 1-1/2 -inch ht., 9/16 -inch face, steel; Armstrong World Industries, Inc.
 - 3) "DXF Main Tee" with 1-25/32 -inch ht., 9/16 -inch face, steel; USG Interiors, Inc..
 - 4) "3500 Series" with 1-5/8 -inch ht., 9/16 -inch face, steel; Chicago Metallic Corp.
 - b. The main runner shall have a non-directional bayonet coupling.
 - 4. Cross Runners: Designed to support lay-in lighting fixtures and to receive acoustical tile at sides of fixture opening. Provide light fixture accessory as required to support specified light fixtures.
 - a. Acceptable Products:
 - 1) "ES4-12-12" Certain Teed.

- 2) "Number XL-7520"; Armstrong World Industries, Inc.
- 3) "DXF Cross Tee"; USG Interiors, Inc.
- 4) "3512 Series Cross Tee"; Chicago Metallic Corp.
5. Perimeter Wall Angles: Hemmed edge, 9/16 -inch x 15/16 -inch , and Shadow Molding in locations as shown on the Drawings.
 - a. "WA15-9", Certain Teed
6. Accessories: Provide all accessories needed for proper installation of system.
7. Finish: All exposed surfaces shall be finished white, unless scheduled otherwise.

2.3 FIBERGLASS CEILING GRID SYSTEM

- A. Avendra, LLC Preferred Manufacturers:
 1. None
- B. Approved Manufacturers:
 1. "Sanigrad II Fiberglass Ceiling Grid System (SAN)"; Crane Composites, Inc. (800-435-0080)
- C. Drawing Designation: "ACT-2"
- D. Materials:
 1. Performance: Provide fiberglass ceiling grid system with the following:
 - a. Meets Class A finish requirements: Flamespread of less than 25, smoke developed less than 450 per ASTM E84 latest version.
 - b. Complies with USDA FSIS requirements.
 2. Components:
 - a. Wall Angles: 12 foot length fastened directly to the wall with "Kemlite" nylon drive rivets or stainless steel screws.
 - b. Hanger Wire: Provided by others, manufacturer's standard; secured with stainless steel anchors.
 - c. Main runners: 12 -feet-0-1/2 -inch, notched on 24- (1/4 -inch) centers.
 - d. Cross Tee: 48 1/2 -inch and 24 (1/2 -inch) lengths, pre-notched ends.
 - e. Connector clip: Joins main runners.
 - f. Wall Anchor: "Part #C-20" to secure main and cross tees to wall angle.
 3. Color: As shown on Interior Finish Specifications Drawings.

2.4 CUSTOM PERIMETER TRIM

- A. Manufacturer:
 1. Avendra, LLC Preferred Manufacturers:
 - a. "Axiom-Classic Custom Perimeter Trim"; Armstrong World Industries, Inc. (888-234-5464)
 2. Approved Manufacturers:
 - a. Approved Substitution

- B. Components: Edge trim system for suspended ceiling system, extruded aluminum alloy 6063 trim channel, 10 foot curved profiles outside radii for acoustical and for drywall applications.
1. Trim Channel: Provide face width as shown on Drawings with 3/4 -inch horizontal legs, curved sections with special bosses formed for attachment to the Axiom tee-bar connection clip or hanging clip; commercial quality, extruded aluminum, factory-finished in factory-applied baked polyester paint to match color of ceiling tile or gypsum board paint as shown on Interior Finish Specifications Drawings.
 2. Accessories:
 - a. Hanging clip, commercial quality aluminum, unfinished, used when suspension wires must be attached directly to the trim sections.
 - b. Splice with set screws, galvanized steel, unfinished, used to attach joints between sections of trim.
 - c. T-bar Connector Clip, galvanized steel, unfinished, used to attach channel trim to supporting suspension members.
 - d. Perimeter Trim Hold Down Clip used to secure cut edges of metal panels at the Axiom trim.
 - e. Drywall Bottom Trim Curved, extruded aluminum, 120 -inches x 1-9/64 -inch x 27/32 -inch, used to finish edges of 5/8 -inch drywall that is applied to the bottom surface of the Axiom.

2.5 ACOUSTICAL MATERIALS

- A. Products:
1. Refer to Interior Finish Specifications Drawings.

2.6 LIGHTING:

- A. Contractor shall be responsible for providing sufficient support on grid systems to support light fixtures.
- B. All fixtures shall be supported at each and every corner.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that suspended ceiling systems are installed in strict accordance with all pertinent codes and regulations, and the manufacturer's recommendations.
- B. Discrepancies: In the event of discrepancy, immediately notify the Owner's Representative. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION

- A. General:

ACOUSTICAL TILE CEILINGS

1. Install acoustical panel, suspension system and accessories in compliance with manufacturers instructions and requirements of [ASTM](#) C636.
2. Install ceiling system in a true and even plane with straight line courses laid out symmetrically about center lines of area or as indicated. Border tile shall be minimum 6" wide and neatly fit against vertical surfaces to form a tight fit.
3. Provide metal edge angle at perimeter of units as detailed on Drawings. Cut and fit around light fixtures, diffusers, etc.

B. Lay-In Ceiling System:

1. Hanging main tees parallel in a flat plane by means of #10 gauge wire hangers attached to construction above. Hangers shall be spaced not over 4-feet -0 -inch along the main tees and within 6 -inch of the ends and splices of main tees, and other interruptions. Main tees shall be spaced 2-feet -0 -inch o.c. Cross tees shall be interlocked to main tees and spaced as required to support tile edges.
2. Attachment to ducts, pipes, etc. will not be permitted. Bridge under obstructions with a grid of 1-1/2 -inch cold rolled channels or other suitable members to support ceiling grid.
3. Install wall angle at perimeter of walls, partitions, columns, pipes, and other obstructions that extend above the ceiling. Securely attach with appropriate fastening devices at maximum 16-inch o.c. Form reveal of same depth and width as that formed between edge of panel and flange at exposed suspension grid. Neatly cut and fit around light fixtures, diffusers, etc. Provide wall angles fabricated to diameter required to fit penetrations.
4. Insert ceiling panels, installing hold down clips on panels extending over partitions and where required to maintain fire ratings.
5. At all locations where ceiling tiles are cut, the cut edges of the tiles shall match the premanufactured edges (i.e. cut edges are to be beveled to match beveled edged tiles). Exposed cut edges are to be painted to match face of tile with paint as approved by tile manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Completely remove all finger prints and traces of soil and damage from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for that purpose by the manufacturer of the material being cleaned.
- B. Replace units which are damaged or improperly installed.

- END OF SECTION -

- SECTION 09 5426 -**LINEAR WOOD CEILINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood Grille ceiling panels with concealed suspension system.
 - 2. Trim and accessories.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 5123 "Acoustical Tile Ceilings".
- C. Division 23 pertinent Sections for coordination with mechanical work at ceiling.
- D. Division 26 pertinent Sections for coordination with lighting fixtures.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM International Publications:
 - 1. C 635: Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - 2. C 636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 3. E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Architectural Woodwork Standards (AWS), 1st ed. 2009, published jointly by:
 - 1. Architectural Woodwork Institute, www.awi.net.org.
 - 2. Woodwork Institute, www.woodworkinstitute.com.
 - 3. Architectural Woodwork Manufacturers Association of Canada, www.awmac.com.

- D. CISCA: Ceiling Systems Handbook.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- C. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- D. Samples: Submit 12 by 18 inch samples of each panel type, pattern and color.
- E. Shop drawings: Provide Shop Drawings/Coordination Drawings, including Reflected Ceiling Plan and Details, for linear wood ceiling panels layout with HVAC and lighting fixtures, fire suppression system components, all perimeter conditions, and installation of wood panels.
- F. Closeout Submittals:
1. Submit under provisions of Section 01 1700.
 2. Warranty: Submit specified warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Acceptable to manufacturer with documented experience on at least 5 projects of similar nature in past 5 years.
- B. Single Source Responsibility: Obtain linear natural wood and linear simulated wood ceiling panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.
- C. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management & Coordination."

1.7 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wood panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components

LINEAR WOOD CEILINGS

to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.

- C. Store products above 50 degrees F, but no greater than 85 degrees F unless otherwise recommended by manufacturer.
- D. Acclimatization: Before installing wood panels, permit them to reach room temperature and a stabilized moisture content (at least 72 hours) per AWI standards.
- E. Handling: Handle Wood Grille Ceiling Panels carefully to avoid chipping edges or damaging units in any way.
- F. Protection:
 - 1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate protective equipment as needed. Read related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner, and manufacturer will rely on contractor's performance in such regard.
 - 2. Existing completed work: Protect completed work above suspension system from damage during installation of suspension system components.

1.9 EXTRA MATERIALS

- A. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Wood Grille Ceiling Panels: Furnish quantity of full-size units equal to 2.0 percent of amount of each type installed.
 - 2. Suspension System Components: Furnish quantity of each component equal to 2.0 percent of amount installed.

1.10 WARRANTY

- A. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.
 - 1. Manufacturers: All materials, wood ceiling and grid, shall be warranted for (1) one year for material and workmanship.
 - 2. Installer: All work shall be warranted for (1) year from final acceptance of completed work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers, primers, and coatings. Comply with limits specified in Section 01 6116.

- B. Fire Performance Characteristics: Wood Grille ceiling panels to have Class 1(A) flame spread rating per ASTM E 84.

2.2 WOOD GRILLE CEILING SYSTEMS

- A. Basis of Design: 9Wood EcoGrille Series 1000 by 9Wood, Inc., Springfield, OR; tel: (888) 7767-9990; web: www.9wood.com .
- B. Subject to exact compliance with requirements, provide named products or comparable products by one of the following:
1. Architectural Components Group, Inc., www.acgiwood.com .
 2. Substitutions: Section 01 2500.
- C. Manufacturer to furnish pre-assembled wood grille panels ready for direct attachment to suspension system. Suspended ceiling system and designated accessories necessary to complete installation furnished by the contractor in compliance with Drawings and this Section.
- D. Wood Panel Description: 9Wood EcoGrille.
1. Species: FSC Pacific Albus
 2. Member Size: 5/8" x 1 1/8"
 3. Edge Profile: Square
 4. Assembly Style: Cross Piece Backer.
 5. Panel Size: As indicated on Drawings
 6. Finish: As indicated on Drawings.
 7. Reveal Scrim: Black reveal scrim.
- E. Suspension Systems:
1. Interior Metal T-Grid Suspension System: Provide standard interior Metal Heavy Duty 15/16 inch suspension T-Grid system using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable seismic codes and ordinances.
 - a. Attachment Devices: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
 - b. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.
- F. Edges, Borders and Perimeter Trims:
1. Edges, borders, and perimeter trims in accordance with standard design details available. All wood ceiling products specified shall be supplied by the ceiling manufacturer.
- G. Provide seismic code compliance by means of mechanical direct screw attachment to metal T-grid through cross piece backer of wood grille panel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Layout: Measure each ceiling area and establish the layout of Linear Wood Ceiling Panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans in accordance with wood ceiling manufacturer's approved Shop Drawings.

3.3 INSTALLATION

- A. General: Install wood grille ceiling systems to comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook."
- B. Installation of Wood Grille Panels: Install Wood Grille ceiling panels in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.
- C. Suspended Systems: Refer to Drawings for locations and detailing.
 - 1. Suspend and attach ceiling hangers from building's structural members per manufacturer's instructions and in compliance with all local codes and regulations.
 - 2. Installation of Metal T-Bar Grid: Install, align, brace, tie-off, mount, handle interferences, and space suspension T-Grid in accordance with suspension manufacturer's instructions and in compliance with all local codes and regulations.
 - 3. Suspension Runners: Install runners so they are square and securely interlocked with one another. Install number and use on-center spacing per wood ceiling manufacturer's instructions, as indicated on approved Shop Drawings and in compliance with all local codes.

3.4 CLEANING

- A. General: Clean exposed wood grille surfaces. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

- END OF SECTION -

- SECTION 09 6013 -**ACOUSTIC UNDERLAYMENT**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Rubber Underlayment: Rebonded recycled rubber Sound Control Insulation Underlayment.
 - 2. Adhesive

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Provide recycled rubber resilient flooring underlayment, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

1.4 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 4339 "Mockup Requirements"
- C. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- D. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- E. Section 01 7400 "Cleaning and Waster Management".
- F. Section 03 3000 "Cast-in-Place Concrete" for concrete substrates.
- G. Section 03 3500 "Concrete Finishing".
- H. Section 03 3570 "Water Vapor Emission Control System"

- I. Pertinent sections of Division 09 specifying flooring overlying sound insulation underlayment.
- J. Section 09 0511 "Concrete Floor Preparation"
- K. Section 09 0512 "Concrete Floor Moisture Content and pH Testing".
- L. Section 09 3013 "Tiling"
- M. Section 09 6500 "Resilient Flooring" (VCT)
- N. Section 09 6566 "Resilient Athletic Flooring"
- O. Appendix B Acoustical Report (Noise Control for the Wall and Floor/Ceiling Assemblies)

1.5 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products
 - 2. ASTM C627 Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
 - 3. ASTM E90-90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - 4. ASTM E492-90 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine.
 - 5. ASTM E1007 Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures
 - 6. ASTM E2179 Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors
 - 7. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - 8. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs using in situ Probes.
 - 9. ASTM D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products

1.6 ACTION SUBMITTALS

- A. General: Submit following items in accordance with Section 01 3300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Complete materials list of Materials proposed to be furnished and installed.

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4. Manufacturer's specifications catalog sheets, hand samples and other items needed to demonstrate compliance with the specified requirements.
 5. Manufacturers recommended installation procedures.
- C. Shop Drawings: Manufacturer's specifications, catalog cuts, and other items needed to demonstrate compliance with the specified requirements.
1. Also include the manufacturer's recommended installation procedures, which, when approved by the architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
 2. Manufacturer's specifications, catalog cuts and other items needed to demonstrate compliance with the specified requirements.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 -inches (150 mm) square, representing actual product, color, and patterns.

1.7 INFORMATIONAL SUBMITTALS

- A. Test Data:
1. Test data from an independent laboratory showing compliance with;
 - a. Acoustical Consultant's requirements of Sound Transmission Class STC and Impact Isolation Class IIC.
- B. Reports:
1. Current ICC Evaluation Services, Inc. Evaluation Report allowing the material to be used for the specified purpose. Material without a current Report is not acceptable for use and will be removed and replaced at the Contractor's sole expense with a material having a current Report.
- C. Quality Assurance submittal of Certificates
1. Manufacturer's installation instructions.
 2. Performance characteristics specified in this document shall be provided by the manufacturer.
- D. Closeout Submittals:
1. Submit under provisions of Section 01 7700.
 2. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The manufacturer shall be a firm with a minimum of two (2) years of successful experience in manufacture of products with similar requirements.
- B. Installer Qualifications: The installer shall be a firm with a minimum of two (2) years of successful experience in installation of products with similar requirements.
- C. VOC Limits for adhesives, sealants, fillers and primers. Comply with limits specified in Section 01 6116.

- D. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer-approved installation methods.
 - 1. Comply with workmanship standard.
 - a. Comply with Section 01 4339 "Mockups"
 - 2. Mock-Up Size and location: As determined by Architect and/or acoustical consultant.
 - 3. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 - 4. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.
- E. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions, and manufacturer's warranty requirements.
- F. Pre-installation Testing: Conduct pre-installation testing as follows: substrate testing; consult with flooring manufacturer.
- G. Obtain sound control insulation materials from a single manufacturer.
- H. Inspection of all surfaces must be done by the manufacturer's representative, or designee, prior to installation of the acoustical underlayment to assure proper surface preparation.
- I. Adhesives must comply with the manufacturer instructions or representative of the manufacturer approval.

1.9 DELIVERY, STORAGE, & HANDLING

- A. General: Comply with Division 1 Product Requirements Sections.
- B. Deliver materials in manufacturer's original, unopened, and undamaged containers with identification labels intact.
- C. Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.10 PROJECT CONDITIONS

- A. Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
- B. Verify actual measurements/opening by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- C. Coordinate with work as specified in Section 03 3000 "Cast-in-Place Concrete".
- D. Coordinate with work as specified in Section 03 3570 "Water Vapor Control System"

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1.11 MAINTENANCE

- A. Extra Materials: Deliver to Owner extra materials from same production run as products installed.
 - 1. Package products with protective covering and identify with descriptive labels.
 - 2. Furnish quantity of re-bonded recycled rubber Impact Sound Insulation units as requested on purchase order.
 - 3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage, and protection of extra materials.

1.12 WARRANTY

- A. Comply with provisions of Section 01 1740.
- B. Rubber:
 - 1. Limited lifetime warranty on the Impact Sound Insulation products against defects in material and workmanship and that product/material shall meet all published specifications and shall perform effectively.
 - a. Manufacturer warranties that during the warranty period material shall not harden, become brittle, chip, crack, tear, or exhibit any signs of excessive deterioration except for normal wear and tear.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Provide products with highest levels of post-consumer and pre-consumer recycled content.
- D. SYSTEM PERFORMANCE:
 - 1. Structural Deflection:
 - a. Performance in accordance with ASTM C627-88 (minimum Residential rating) for Ceramic Tile Installations.
 - 2. Thermal:
 - a. Performance in accordance with ASTM C177-85 with a minimum "R" value of 3.125 (per inch)
 - 3. Flame Spread:
 - a. Performance Compliance in accordance with ASTM E 84 Class "A" (assembly)
 - 4. Shear Bond:
 - a. Minimum Value **50 psi** (Ceramic Tile)
 - 5. Testing shall be conducted by an independent laboratory accredited by the U.S. Dept. of Commerce, NVLAP

6. Acoustical:
 - a. All products shall be tested for acoustical values in accordance with;
 - 1) ASTM E90-90 for STC values.
 - 2) ASTM E492-90 for IIC values.
 - b. Product performance tested IIC value shall be:
 - 1) As indicated in Acoustical Report Appendix herein included in this specification Project Manual
- E. All products shall be tested for structural and deflection performance in accordance with ASTM C627-88 and shall have a minimum of a residential construction rating.
- F. Water Vapor Emission and Alkalinity performance criteria for concrete substrate:
 1. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **5 lbs** of water/**1000 sq. ft.** (**2.4 kg of water/92.9 sq. m**) in 24 hours.
 2. Proceed with installation only after substrates have maximum **75 percent** relative humidity level measurement.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain awnings from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- C. Rubber product:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide **QT Sound Insulation**, Impact Sound Control Underlayment and accessories as manufactured by **ECORE** International, <http://www.ecoreintl.com/index.php>, <http://www.qtsoundcontrol.com> or comparable product by an alternate manufacturer:

2.3 MATERIALS –RUBBER

- A. Schedule – Ecore QTscu
 1. QT™ Re-bonded Recycled Rubber Impact Sound Insulation and Adhesive system.
 - a. Underlayment:
 - 1) Product Name: Ecore QTscu Recycled Rubber Impact Sound Insulation Underlayment:
 - 2) Type: Flat sheet
 - 3) Material:
 - a) **92 percent** recycled SBR (Styrene-Butadiene Rubber) tire rubber.
 - 4) IIC Value: As herein specified or referenced to other documents
 - 5) Sheet dimension and weight:
 - a) QT 4010: **3/8 -inch (10 mm)** standard in **4 -feet** by **15 -feet (1.2 m by 4.6 m)** roll size by **1.5 lb/ft² (7.2 kg/m²)**
 - 6) Waterproof Option: No
 - 7) Testing /Standards:

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- a) Impact Insulation Class Laboratory (ASTM E492): Specified floor-ceiling assembly must be tested in a NVLAP certified laboratory and comply with ASTM standards.
- b) Impact Insulation Class Field (ASTM E1007): Floor-ceiling assembly must meet requirement as stated by building code and/or acoustical consultant.
- c) ASTM E2179: Shall be LAB tested over an 6 -inch concrete slab with tile, no ceiling assembly, with an IIC rating of 50 or greater.
- d) Shall be ICC-ES certified
- e) Shall be UL listed

b. Perimeter Isolation Strips:

1) Option:

- a) Product Name options: Ecore's QT Re-bonded Recycled Rubber Perimeter Isolation Strip.
- b) Application: Flat resilient strip that is used to build a tub around the floor so that no hard surface (floor covering) touches any hard vertical surface protrusion or wall.
- c) Material: 100 percent recycled SBR (Styrene-Butadiene Rubber) tire rubber, Perimeter Isolation Strip is a flat, resilient strip.
- d) Size: Rolled perimeter isolation strip will have an overall thickness of 1/4 -inch (5mm) in 30 -foot (76mm by 9,144mm) roll size.

2) Option:

- a) Product Name: Ecore's QT Polyethylene Foam Perimeter Isolation Strip.
- b) Application: Flat, resilient strip that is used to build a tub around the floor so that no hard surface (floor covering) touches any hard vertical surface (protrusion or wall).
- c) Material: White polyethylene foam
- d) Size: Rolled perimeter isolation strip will have an overall thickness of 15/64 -inch (6mm) in 2 1/2 -inch by 50 -foot (64mm by 1,52404mm) roll size.

c. Adhesive:

1) Product Name: Ecore's E-Grip™ III

2) Material:

- a) E-Grip III is a one-component polyurethane moisture cured, non-sag, permanently elastic adhesive that has excellent adhesion to elastomers, concrete, and wood and is engineered for indoor and outdoor applications.

3) Type: One-component polyurethane

4) Cure System: Moisture cured

5) Weight:

- a) 4 gallon pail-56 lbs.
- b) 2 gallon pail-28 lbs.

6) Color: Medium grey

- 7) Performance:
- a) VOC Content: 0 Calculated
 - b) Freeze/Thaw: Stable
 - c) Application Temperature: 40° F - 100° F
 - d) Relative Humidity Test (ASTM F2170): Maximum 85 percent
 - e) Calcium Chloride Test (ASTM F1869): Maximum 5.5 lbs./1,000 sq. ft. in 24 hrs.
 - f) Flashpoint: >500° F
 - g) Shelf Life: 12 months
 - h) Working Time: 30-40 minutes
 - i) Trowel: 1/16 -inch square notched trowel ⁽¹⁾
 - j) Coverage Rate: 95 ft² per gallon (1/16 -inch square notched trowel)
 - k) SCAQMD Rule #1168: 0 calculated

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.2 EXAMINATION

- A. Examine conditions and proceed with Work when substrates are ready.
- B. Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for acoustic underlayment installation by testing for moisture and pH.
- 1. Test in accordance with Section 09 0512.
 - 2. If test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511, and install Water Vapor Emission Control Coating as specified in Section 07 2633.

3.3 PREPARATION

- A. General:
- 1. Prepare and clean substrates according to manufacturer's written instructions.
 - 2. Surfaces shall be prepared in accordance with ANSI standards.
 - 3. Broom or vacuum clean substrates to be covered immediately before product installation.

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- a. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
 - b. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Concrete Substrates: Prepare according to ASTM F 710 and the following.
- 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Prepare as specified in related Section 09 0511 "Concrete Floor Preparation".
 - a. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Testing of substrate:
 - a. Alkalinity and Adhesion Testing:
 - 1) Verify that testing has been done under Section 09 0512 "Concrete Floor Moisture Content and pH Testing".
 - a) Proceed with installation in accordance with this specification only after substrates pass testing.
 - b. Moisture Testing: Tests recommended by manufacturer and as follows.
 - 1) Verify that testing has been done under Section 09 0512 "Concrete Floor Moisture Content and pH Testing".
 - a) Proceed with installation only after substrates pass testing.
 - c. Concrete Water Vapor Emission Control System:
 - 1) Verify that work has been complete and is installed as specified in related Section 03 3570 "Water Vapor Emission Control System".
 - a) Proceed with installation only after substrates have tested to the maximum relative humidity level as herein specified and in accordance with manufacturers written requirements.
 - 4. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.
 - 1) Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
 - a) Refer to Section 03 3500 "Concrete Finishing".
 - 5. Concrete floor shall be fully cured and permanently dry.
 - a. Subfloor shall be dry, clean, smooth, level and structurally sound.
 - b. It should be free of dust, solvent, paint, wax, oil, grease, asphalt, sealers, curing and hardening compounds, alkaline salts, and other extraneous materials, according to ASTM F 710.

3.4 INSTALLATION – RUBBER UNDERLAYMENT

- A. General:
- 1. Refer to other sections listed in Related Sections paragraph herein for related products installation.
 - 2. Installation should not begin until all other trades are finished in the area.
 - 3. Areas to receive Impact Sound Insulation should be weather tight and maintained at a minimum uniform temperature of 65 F (18 °C) for 48 hours before, during, and after the installation.

4. Comply with underlayment manufacturer's Technical Manual and/or written instructions for procedures and techniques for installation.
- B. Isolation Strips:
 1. Remove the release line and attach at perimeter to walls in accordance with manufacturers recommendations.
 2. Install the material so it is perpendicular to the finish flooring material to be installed over the top of it.
- C. Underlayment:
 1. Cut underlayment to desired lengths and place against the perimeter Isolation strips
 2. Butt the underlayment tight to the perimeter isolation strips.
- D. Adhesive:
 1. Install underlayment to required extents directly to subfloor with appropriate adhesive.
 2. Do not mechanically fasten underlayment to subfloor.
 3. Fully adhere the underlayment to substrate.
 4. Spread adhesive 90 degrees to the seams between underlayment.
 5. Use a 30lb to 50lb roller to roll floor with 45 minutes of installation to ensure proper transfer of adhesive and remove any air bubbles.
 - a. Confirm time with adhesive used.
- E. Baseboard:
 1. Baseboard shall not touch finish flooring.
- F. Wood flooring conditions:
 1. Adhesive used to adhere underlayment to substrate shall be the same as used to adhere finish wood flooring to underlayment

3.5 FIELD QUALITY REQUIREMENTS

- A. Provide manufacturer's field service consisting of product use recommendations in accordance with manufacturer's instructions.
- B. Field Tests should be performed by an independent acoustical laboratory accredited by the U.S. Department of Commerce, National Institute of Standards and Technology under the National Voluntary Laboratory Accreditation Program for the specified test procedure.
- C. The cost for all field acoustical testing, corrective work associated with the installation of the re-bonded recycled rubber Impact Sound Insulation and flooring to meet the minimum requirements, shall be borne by the flooring contractor(s).

3.6 PROTECTION AND CLEANING

- A. Protect adjacent surfaces, landscaping and property from spillage, overspray, or drift.
- B. Remove temporary coverings and protection of adjacent work areas.
 1. Repair or replace damaged installed products.

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2. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
3. Remove construction debris from project site and legally dispose of debris.

3.7 SCHEDULE

- A. Install beneath hard-surface flooring material except carpet that's above a Guest room or Meeting room and any other areas indicated on Drawings.

- END OF SECTION -

- SECTION 09 6340 -**STONE FLOORING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Stone slab material for;
 - a. Stair treads – refer to Drawings for specific Stone material
 - b. Stair risers – refer to Drawings for specific Stone material
 - c. Thresholds (“ST-1”)
 - 2. Setting beds, grouting, miscellaneous materials, control and expansion joints.
 - 3. Waterproof / Anti-fracture membrane.
 - 4. Metal edge strips.
- B. Related scope not included in this Section:
 - 1. Stone Tiling Flooring and Base. Refer to Section 09 3033 “Stone Tiling (Interior)”

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 9113 “General Commissioning Requirements”
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Section 05 5150 “Architectural Metal Stairs” which will receive stone material on treads and landings.
- E. Section 07 9200 “Joint Sealants” for sealing joints in stone tile with elastomeric sealants, not specified in this section.
- F. Section 09 3013 “Tiling” for interior glazed wall stone tile and mosaic floor stone tile.
- G. Section 09 3053 “Exterior Tiling” for porcelain stone tile wall cladding.

- H. Section 09 3073 "Swimming Pool Ceramic Tiling" for glazed wall stone tile and mosaic floor stone tile.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. American Society for Testing and Materials (ASTM)
- C. Indiana Limestone Institute of America, Inc, "ILI Handbook and Technical Notes"
- D. Marble Institute of America, (MIA) "Dimension Stone Design Manual"
- E. National Building Granite Quarries Association, Inc. (NBGQA), "Stone Granite Specs, Version 11-2 or most current edition.

1.5 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of stone tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Stone Treads and Landings: Stone units 1 1/4 -inch thick or greater.
- C. Honed Finish: Smooth, non-reflective finish similar to that produced by grinding with a 400- to 1200-grit abrasive; with a gap not exceeding 0.005 -inch (0.13 mm), when faces are tested for flatness with a 24-inch (600-mm) straightedge.
- D. Natural-Cleft Finish: Uneven surface produced by splitting stone along a natural cleavage plane; without visible tool marks and with a gap not exceeding 3/16 -inch (5 mm), when faces are tested for flatness with a 24-inch (600-mm) straightedge.
- E. Polished Finish: Smooth finish that produces sharp, mirror-like reflections. Reflected images of overhead fluorescent tubes have straight lines without visible distortion when viewed at arm's length.
- F. Sand-Rubbed Finish: Uniform, fine-textured surface similar to that produced by grinding with a 40-grit abrasive; with a gap not exceeding 1/32 -inch (0.8 mm), when faces are tested for flatness with a 24-inch (600-mm) straightedge.
- G. Sizes:
 - 1. Treads: Size to fit tightly from stringer to stringer.
 - 2. Landings: Equal sizes with single seam as approved by Architect.
- H. Thermal/Tumbled Finish: Uniform, coarse-textured surface produced by thermal shock; with a gap not exceeding 3/16 -inch (5 mm), when faces are tested for flatness with a 24-inch (600-mm) straightedge.

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300 "Submittal Procedures".
- B. Product Data: Submit product data for all products, colors, finishes, etc.
- C. Samples for Initial Selection:
 - 1. For each stone type indicated, in sets of Samples not less than 12 -inches (300 mm) square.
 - a. Include four or more Samples in each set and show the full range of variations in appearance characteristics expected in completed Work.
 - b. Samples will establish the standard by which stone will be judged.
 - 2. Include;
 - a. Samples of accessories involving color selection.
 - b. For joint materials involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type of stone flooring and base in each finish required.
 - 2. Assembled Samples with grouted joints for each type of stone flooring and base and for each finish required, at least 36 -inches (900 mm) square and mounted on a rigid panel.
 - a. Use grout of type and in color(s) approved for completed Work.
 - 3. Stone thresholds in 6-inch (150-mm) lengths.
 - 4. Metal edge strips in 6-inch (150-mm) lengths.
- E. Shop Drawings:
 - 1. Show stone profile for stair treads and landings.
 - 2. Show extents in plan view.
 - 3. Show locations and details of joints both within stone flooring at landings and between stone flooring and stringers at treads and landings.
 - 4. Show direction of veining, grain, or other directional patterns.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Material Test Reports:
 - 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, according to referenced ASTM standards.
 - a. Base reports on testing within previous three years.
- C. Maintenance Data: For stone flooring to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.8 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 7700 "Closeout Procedures".

- B. Warranty: Submit specified warranty.

1.9 QUALITY ASSURANCE

- A. Supplier Qualifications for Stone Tiling: A firm experienced in supplying products similar to those indicated for the Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone flooring.
- C. Installer Qualifications: Fabricator of stone flooring.
- D. Installer Qualifications: A firm or individual experienced in installing stone flooring similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- E. Source Limitations for Stone and Thresholds: Obtain each variety of stone, regardless of finish, from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.
1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
 2. Make quarried blocks available for examination by Architect for appearance characteristics.
 3. Make stone slabs available for Architect to examine for appearance characteristics.
 - a. Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.
 - b. Segregate slabs selected for use on Project and mark backs indicating approval.
- F. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Thin set mortar
 2. Joint Sealant
- G. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
1. Schedule:
 - a. Build mockup of one stair tread which may become part of final work.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Review requirements for substrates and for preparation by other trades.
 - 2. Attendees should include, but not limited to;
 - a. General Contractor
 - b. Architect
 - c. Owner's representative
 - d. Setting material representative
 - e. Tile installation contractor

1.11 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000 "Product Requirements".
- B. Deliver materials to Project site in factory wrappings, clearly labeled with identification of manufacturer and lot number.
- C. Store stone and cementitious materials on elevated platforms, under cover, and in a dry location.
- D. Store liquid materials in unopened containers and protected from freezing and direct sunlight.
- E. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 - 2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- F. Mark stone units, on surface that is concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

1.12 PROJECT CONDITIONS

- A. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.
- B. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F (10 deg C) during installation and for seven days after completion.
 - 1. Do not install stone tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.13 SEQUENCING AND SCHEDULING

- A. Stairs:
 - 1. Sequence stone flooring installation with stair construction to install stone as final aspect of stair construction.
 - 2. Install stone and accessories only after other finishing operations, including painting of stringers and railings have been completed.

1.14 EXTRA MATERIALS

- A. Comply with provisions of Section 01 7700 "Project Closeout".
- B. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and place in Owner's storage area.
- C. Stone Treads: Furnish two (2) full-size tread units of amount installed, matching all aspects of tread; composition, color, pattern, and size indicated/installed.
- D. Sealant: Provide three (3) tubes of sealant used in installation.

1.15 WARRANTY

- A. Comply with provisions of Section 01 7700.
- B. Assembly:
 - 1. Provide single source warranty by setting, grout and membrane manufacturer for not less than (25) twenty-five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Provide products contributing to Credit MR 5, from manufacturer or source within 500 mile radius of project site.
- C. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Static Coefficient of Friction
 - a. Standard: ASTM C1028
 - b. Tested value: 0.6 minimum for level surface
 - 2. Wet DCOF (Dynamic Coefficient of Friction)
 - a. Standard: ANSI A137.1-2012, Section 9.6
 - b. Method: DCOF AcuTest method

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- c. Device: BOT-3000
 - 1) Test shall be done using 0.05 percent sodium lauryl sulfate solution.
- d. Measurement: Dynamic Friction
- e. Application: Level interior flooring surface
- f. Tested value: 0.42 or greater

- D. FloorScore Compliance: Stone for floors shall comply with requirements of FloorScore Standard.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products as specified and indicated on Drawings.
- B. Basis of Design Product: Subject to compliance with requirements, provide products as indicated on Drawings or as selected by Architect.
- C. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
 - 2. Make quarried blocks available for examination by Architect.
 - 3. Make stone slabs available for examination by Architect.
 - a. Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.
 - b. Segregate slabs selected for use on Project and mark backs indicating approval.
 - c. Mark and photograph aesthetically unacceptable portions of slabs as directed by Architect.

2.3 MATERIALS, GENERAL

- A. Factory Blending: For stone flooring and Base, blend stone in factory and package so stone units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- B. Stone Products:
 - 1. Varieties and Sources: Subject to compliance with requirements for each stone product type, provide one of the stone varieties indicated.
 - 2. Where threshold types are identical to stone flooring and base types except for size or finish, provide same variety from same source for each type.
 - 3. Abrasion Resistance: Provide stone with a value of not less than 10, as determined per ASTM C 1353 or ASTM C 241.
 - 4. Provide stone products that are free of defects impairing their function for use indicated, including cracks, seams, and starts.

2.4 MARBLE ("ST-1")

- A. Basis of Design: Dal Tile, Quartz M710 Chiaro Classico 2 -inch by 36 -inch with double bevel profile
- B. Material Standard: Comply with ASTM C 503 and one of the following as indicated and/or selected by Architect:
 - 1. Group C
 - a. Stone Abrasion Resistance: Minimum value of 10 , based on testing according to ASTM C 241/C 241M or ASTM C 1353.
- C. Description: Uniform, fine- to medium-grained, stone with only slight veining.
 - 1. Color as selected and/or provided by Architect.
- D. Varieties and Sources: Subject to compliance with requirements, refer to drawings.
- E. Cut: Vein unless indicated otherwise in drawings.
- F. Finish: As indicated and Match Architect's sample(s)
- G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.5 GRANITE

- A. Material Standard: Comply with ASTM C 615.
- B. Description:
 - 1. Uniform, fine or medium-grained as selected and/or indicated in drawings
- C. Varieties and Sources: Subject to compliance with requirements, refer to drawings.
- D. Cut: Vein unless indicated otherwise in drawings.
- E. Finish:
 - 1. As indicated and Match Architect's sample(s)
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.6 LIMESTONE

- A. Material Standard: Comply with ASTM C 568.
 - 1. Classification: III High Density unless indicated otherwise on drawings.
 - 2. Stone Abrasion Resistance: Minimum value of 10 , based on testing according to ASTM C 241/C 241M or ASTM C 1353.
- B. Description:
 - 1. Dolomitic and/or

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- 2. Oolitic and/or
 - 3. Shell limestone,
 - 4. Refer to drawings.
- C. Varieties and Sources: Subject to compliance with requirements, refer to drawings.
- D. Cut: Vein unless indicated otherwise in drawings.
- E. Finish: (matching standard ILI finish.)
- 1. As indicated and Match Architect's sample(s)
- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.7 MANUFACTURERS – INSTALLATION MATERIALS

- A. Basis-of-Design: The design is based on products as specified by **Laticrete International**.
- B. Alternate Manufacturers: Subject to compliance with requirements including "System Warranty", manufacturers offering products that may be incorporated into the Work include:
 - 1. Custom Building Products.
 - 2. MAPEI Corp.

2.8 WATERPROOF CLEAVAGE MEMBRANE – SHEET (INTERIOR)

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; **0.030-inch (0.76-mm)** nominal thickness.
 - 1. Products: Basis of Design, subject to compliance with requirements, provide the following:
 - a. **Noble Company (The); Chloraloy.**

2.9 WATERPROOF / ANTI-FRACTURE MEMBRANE – LIQUID APPLIED (INTERIOR)

- A. General:
 - 1. For thin set tile applications at walls, floors and ceilings.
 - 2. Manufacturer's standard product that complies with ANSI A118.10.
- B. Schedule:
 - 1. Product: (Basis of Design)
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: Hydroban®
 - c. Data Sheet: 663.0 and 663.5
 - d. System warranty: 25 years (DS 025.0APD)

2.10 CEMENTITIOUS SELF-LEVELING BED ASSEMBLY MATERIALS

- A. Cementitious based, free flowing underlayment: ASTM C1583 and ASTM C1708
 - 1. Concrete substrate primed:
 - a. Primer as specified as specified.
 - 2. Reinforcing: None
 - 3. Underlayment bed:
 - a. Manufacturer's fast setting polymer fortified cementitious underlayment comprised of selected raw materials, portland cement and graded aggregates to be mixed with potable water.
 - b. Basis of Design:
 - 1) Mfgr: Laticrete International, Inc.
 - 2) Product: NXT Level Plus
 - 3) Data Sheet: DS-505.0-0813, TDS 230N & TDS 235N
 - 4) System warranty: 25 years (DS 025.0APD)

2.11 PRIMER FOR CEMENTITIOUS SELF-LEVELING BED ASSEMBLY MATERIALS

- A. Water based primer:
 - 1. Concrete substrate: Cleaned per manufacturers written recommendations.
 - a. Laticrete: TDS 230N
 - 2. Underlayment bed:
 - a. Manufacturer's fast setting polymer fortified cementitious underlayment comprised of selected raw materials, portland cement and graded aggregates to be mixed with potable water.
 - b. Basis of Design:
 - 1) Mfgr: Laticrete International, Inc.
 - 2) Product: NXT™ Primer
 - 3) Data Sheet: DS-502.0-0813
 - 4) System warranty: 25 years (DS 025.0APD)

2.12 THICK REINFORCED MORTAR BED ASSEMBLY MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 - 1. Cleavage Membrane:
 - a. Sheet membrane as specified.
 - 2. Reinforcing Wire Fabric:
 - a. Galvanized, welded wire fabric, 2 -inch by 2 -inch (50.8 by 50.8 mm) by 0.062 -inch (1.57 mm) in diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M except for minimum wire size.
 - 3. Mortar Bed:
 - a. Manufacturer's polymer fortified mortar bed comprised of selected raw materials, portland cement and graded aggregates to be mixed with potable water.
 - b. Basis of Design:
 - 1) Mfgr: Laticrete International, Inc.

- 2) Product: 3701 Fortified Mortar Bed
- 3) Data Sheet: 100.0
- 4) System warranty: 25 years (DS 025.0APD)

2.13 SETTING MATERIALS

- A. Medium-Bed, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of **3/4 -inch (19 mm)**.
 - 1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: 255 Multimax
 - c. Data sheet: 255.0
 - d. System warranty: 25 years (DS 025.0APD)
 - 2. Alternate Manufacturers: Subject to compliance with requirements, a comparable products by one of the following may be acceptable:
 - a. Bostik, Inc.
 - b. C-Cure.
 - c. Custom Building Products.
- B. Thin -Set, Latex-Portland Cement Mortar: ANSI A118.4.
 - 1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: 4-LXT polymer fortified adhesive mortar, Laticrete International, Inc.
 - c. Data sheet: 080.0
 - d. System warranty: 25 years (DS 025.0APD)
 - 2. Alternate Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. C-Cure.
 - c. Custom Building Products.

2.14 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 1. Basis of Design:
 - a. Mfgr: Laticrete International, Inc.
 - b. Product: Spectralock Pro® Premium Grout
 - c. Data sheet: 681.0
 - d. System warranty: 25 years (DS 025.0APD)
 - 2. Alternate Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. C-Cure.
 - c. Custom Building Products.

- B. Grout Admixture: Type as recommended by the manufacturer.
- C. Grout Release: Type recommended by the tile manufacturer.
- D. Grout Color: As selected by Architect.
- E. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 deg F (60 deg C)** and **212 deg F (100 deg C)**, respectively, and certified by manufacturer for intended use.

2.15 THRESHOLDS

- A. Material, complying with [ASTM](#) C503 requirements, Grade A, free from cracks, chips, stains, or other defects, uniform in tone and coloring. Minimum abrasive-hardness value of 10 per [ASTM](#) C241. Finish to be fine sand-honed on faces and beveled edges.
- B. Color and size as shown in Interior Finish Specifications Drawings.

2.16 ACCESSORIES

- A. Finishing and Edge Protection:
 - 1. Basis of Design: The design is based on **Schluter System**, www.schluter.com (800-574-8481).
 - a. Profiles:
 - 1) SCHIENE: Edge of tile butt edge transition to dissimilar flooring.
 - 2) RENO-T: T shape level transition to dissimilar flooring
 - 3) RENO-TK: Sloped transition to thinner flooring such as carpet
 - 4) RENO-U: Step down smooth transition with butt edge to thinner flooring
 - 5) RENO-V: Adjustable sloped smooth overlapping transition onto thinner flooring
 - 6) DILEX-AHK: **3/8 -inch** Cove shaped profile for inside corner of floor tile to wall tile with preformed exterior and interior corners, connectors and end caps.
 - 7) JOLLY: Vertical 90 degree edge protection that buttes into adjacent tile.
 - 8) RONDEC-STEP: Horizontal 90 degree exposed **1 1/2 -inch** or **2 1/4 -inch** face edge protection with preformed exterior and interior corners.
 - 9) Other Profiles as shown on the drawings.
 - b. Color and Material:
 - 1) As indicated in Drawings, otherwise as selected by Architect.
 - c. Sizes as required to suit stone assemblies including setting bed.

2.17 ELASTOMERIC SEALANTS (INTERIOR)

- A. General: Provide manufacturer's standard chemically curing, elastomeric silicone sealants of base polymer and characteristics indicated below that comply with applicable requirements in Division 7 Section "Joint Sealants."
1. Single-component, mildew-resistant, neutral-curing silicone sealant.
 2. Single-component, nonsag urethane sealant.
 3. Acrylic sealants not allowed.
 4. Use grout manufactures color matching sealant.
- B. Schedule:
1. Product: (Basis of Design)
 - a. Mfgr: **Laticrete International, Inc.**
 - b. Product: **LATASIL™**
 - c. Data Sheet: 6200.1
 - d. System warranty: 25 years
 - e. Primer: LATASIL 9118 Primer for use with porous stone, submerged, and permanent wet area's.
 2. Refer also to Section 07 9200 for installation and preparation requirements.
- C. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.18 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Protective Coating: Liquid grout-release coating that is formulated to protect exposed surfaces of stone tile against adherence of mortar and grout; compatible with stone, mortar, and grout products; easily removable after grouting is completed without damaging grout or stone tile; and recommended for use as temporary protective coating for stone tile.
1. Floor sealer, complying with "Floor Sealer" Paragraph below, may be used provided it is recommended by manufacturer for use as a grout release.
- C. Cleaner: A neutral cleaner capable of removing soil and residue without harming stone and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: (Non epoxy grouts) Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
- E. Floor Sealer: Colorless, slip- and stain-resistant sealer, not affecting color or physical properties of stone surfaces as recommended by stone tile producers for application indicated.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following as approved by tile and grout manufacturers:
 - a. Bostik Findley.

- b. Custom Building Products.
 - c. HMK Stone Care System.
 - d. Summitville Stone tiles, Inc.
- F. Crack Suppression Membranes for Thin-Set Stone installation:
 - 1. Manufacturer's standard product that complies with ANSI A118.10.
- G. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer and, if a sealer is specified, by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
- H. Floor Sealer: Colorless, slip- and stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Building Products.
 - b. Miracle Sealants Company.
 - c. Summitville Tiles, Inc.
- I. Reinforcing Wire- Setting Beds: Galvanized, welded, 0.062-inch (1.57-mm-) diameter wire; 2-by-2-inch (50-by-50-mm) mesh; comply with ASTM A 185/A 185M and ASTM A 82/A 82M except for minimum wire size.

2.19 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.20 STONE FABRICATION

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
 - 1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.
- B. Fabricate stone to comply with requirements indicated and with the following references:
 - 1. General:
 - a. Comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
 - 2. Granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."

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3. Limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
 4. Marble, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."
- C. Cut stone to produce pieces of thickness, size, and shape indicated.
1. Stone Thickness: 3/4 -inch (20 mm) to 1 -inch (25 mm) unless otherwise indicated in drawings.
 2. Pattern(s):
 - a. As indicated on drawings:
 3. Stone Edges:
 - a. Square cut with top corner slightly eased to prevent snipping
 4. Joint Width:
 - a. 1/8 -inch (3 mm) unless indicated otherwise
- D. Pattern Arrangement: Fabricate and arrange stone units with veining and other natural markings to comply with the following requirements:
1. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
 2. Arrange units:
 - a. in blend pattern unless indicated otherwise in drawings
 3. Book match adjacent units in each row and between adjacent rows.
 4. Book match adjacent units in each row, and arrange units in end-slip pattern between adjacent rows.
 5. Arrange units in side-slip and end-slip pattern.
 6. Arrange four units adjoining center point of room in two-way book match, and arrange surrounding units in side-slip and end-slip pattern.
 7. Number stone units and note numbers on Shop Drawings to designate installation location of each unit.
- E. Stone Stair Treads: Fabricate stone stair treads in sizes and profiles indicated. Rout grooves into treads to receive abrasive strips and install strips to comply with manufacturer's written instructions.
- F. Carefully inspect finished stone units at fabrication plant for compliance with appearance, material, and fabrication requirements. Replace defective units. Clean sawed backs of stones to remove rust stains and iron particles.
1. Grade and select stone for overall uniform appearance when assembled in place.
 2. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples and mockups.
- G. Stone Thresholds: Fabricate in sizes and profiles as indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges of thresholds at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 -inch (13 mm) or less, and finish bevel to match adjacent surfaces of threshold.
 2. Where difference in floor levels exceeds 1/2 -inch (13 mm), cant 2 foot border stone at max 1:12 slope as shown, or bevel edge of threshold at 1:12 slope, aligning lower edge of bevel with adjacent floor finish. Finish bevel to match adjacent surfaces of threshold.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- C. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped **1/4 -inch** per **foot (1:50)** toward drains.
- D. Before setting stone, clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 INSTALLATION, GENERAL

- A. Do necessary field cutting as stone is set. Cut lines straight and true and finish field-cut edges to match shop-cut edges.
 - 1. Use power saws with diamond blades to cut stone except for stone that is specified to have rough-split edges.
- B. Set stone to comply with requirements indicated.
 - 1. Match stone for color and pattern by using units numbered in sequence as indicated on Shop Drawings.
- C. Scribe and field cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.
- D. Provide control and expansion joints of widths and at locations indicated. Keep control and expansion joints free of mortar, grout, and other rigid materials.
- E. Finishing and Edge Protection for stair nosing's:
 - 1. Refer to drawings and/or details.

3.4 INSTALLATION TOLERANCES

- A. Variation in Line: For positions shown in plan for edges of flooring, ramps, steps, changes in color or finish, and continuous joint lines, do not exceed:
1. $\frac{1}{8}$ -inch in 10 -feet (3 mm in 3 m)
 2. $\frac{1}{4}$ -inch in 20 -feet (6 mm in 6 m),
 3. or $\frac{3}{8}$ -inch (10 mm) maximum.
- B. Variation in Joint Width: Do not vary from average joint width more than plus or minus $\frac{1}{16}$ -inch (1.5 mm) or one-fourth of nominal joint width, whichever is less.
- C. Variation in Surface Plane: Do not exceed:
1. $\frac{1}{8}$ -inch in 10 -feet (3 mm in 3 m)
 2. $\frac{1}{4}$ -inch in 20 -feet (6 mm in 6 m),
 3. or $\frac{3}{8}$ -inch (10 mm) maximum from level or slope indicated.
- D. Variation in Plane between Adjacent Units (Lipping): Do not exceed $\frac{1}{32}$ -inch (0.8-mm) difference between planes of adjacent units.

3.5 INSTALLATION OF STONE BONDED TO CONCRETE

- A. Saturate concrete with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- B. Apply mortar-bed bond coat to damp concrete and broom to provide an even coating that completely covers the concrete. Do not exceed $\frac{1}{16}$ -inch (1.5-mm) thickness. Limit area of mortar-bed bond coat to avoid its drying out before placing setting bed.
1. Place reinforcing wire mesh over concrete, lapped at joints by at least one full mesh and supported so mesh becomes embedded in middle of mortar bed. Hold edges back from vertical surfaces about $\frac{1}{2}$ -inch (13 mm).
- C. Apply mortar bed immediately after applying mortar-bed bond coat. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.
- D. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- E. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform $\frac{1}{16}$ -inch (1.5 mm) thick bond coat to mortar bed or to back of each stone unit.
- F. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.
- G. Rake out joints to depth required to receive grout or pointing mortar] as units are set.
- H. Point joints after setting. Fill full with mortar type and color indicated. Tool joints flat, uniform, and smooth, without visible voids.

3.6 INSTALLATION OF STONE OVER CLEAVAGE MEMBRANE

- A. Place cleavage membrane over substrates indicated to receive stone, lapped at least **4 -inches (100 mm)** at joints.
- B. See waterproofing Section for installation of waterproofing.
 - 1. Carefully place stone and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with stone flooring.
 - 2. Provide cork joint filler, where indicated, at waterproofing that is turned up on vertical surfaces or, if not indicated, provide temporary filler or protection until stone flooring installation is complete.
- C. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- D. Place reinforcing wire fabric over cleavage membrane, lapped at least one full mesh at joints and supported so mesh becomes embedded in middle of mortar bed. Hold edges back from vertical surfaces and control and expansion joints about **1/2 -inch (13 mm)**.
- E. Place mortar bed over cleavage membrane with reinforcing wire fabric fully embedded in middle of mortar bed. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.
- F. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- G. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform **1/16 -inch (1.5-mm-)** thick bond coat to mortar bed or to back of each stone unit.
- H. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.
- I. Rake out joints to depth required to receive grout or pointing mortar as units are set.

3.7 INSTALLATION OF STONE OVER WATERPROOFING

- A. Place cleavage membrane over substrates indicated to receive stone, lapped at least **4 -inches (100 mm)** at joints.
- B. See waterproofing Section for installation of waterproofing.
 - 1. Carefully place stone and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Replace

protection materials that become displaced and arrange for repair of damaged waterproofing before covering with stone flooring.

2. Provide cork joint filler, where indicated, at waterproofing that is turned up on vertical surfaces or, if not indicated, provide temporary filler or protection until stone flooring installation is complete.
- C. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 1. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- D. Place reinforcing wire fabric over waterproofing, lapped at least one full mesh at joints and supported so mesh becomes embedded in middle of mortar bed. Hold edges back from vertical surfaces and control and expansion joints about 1/2 -inch (13 mm).
- E. Place mortar bed over waterproofing with reinforcing wire fabric fully embedded in middle of mortar bed. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.
- F. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- G. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform 1/16 -inch (1.5-mm-) thick bond coat to mortar bed or to back of each stone unit.
- H. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.
- I. Rake out joints to depth required to receive grout as units are set.

3.8 EXPANSION CONTROL

- A. Verify location of all control & expansion joints in substrates prior to installation.
- B. Expansion joints at stone finish to occur directly on top of substrate expansion and control joints and all other locations required by referenced standards.

3.9 GROUTING

- A. Grout stone joints to comply with ANSI A108.10 and with manufacturer's written instructions.
 1. Do not use sanded grout for polished stone.
 2. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining stone and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free of drying cracks.

- B. Grout stone joints with water-cleanable epoxy grout to comply with ANSI A108.6 and with manufacturer's written instructions.

3.10 STONE STAIR TREADINSTALLATION

- A. Install stone stair treadsto comply with "Installation of Stone Bonded to Concrete" Article.
- B. Install stone stair treadsin:
 - 1. Water-cleanable epoxy adhesive to comply with ANSI A108.4.

3.11 STONE THRESHOLD INSTALLATION

- A. At locations adjacent to stone flooring, install stone thresholds in same type of setting bed as abutting stone flooring unless otherwise indicated.
 - 1. Set thresholds in thin-set, latex-portland cement mortar to comply with ANSI A108.5 at locations where mortar bed would otherwise be exposed above other adjacent flooring.
- B. At locations not adjacent to stone flooring, install stone thresholds in:
 - 1. Water-cleanable epoxy adhesive to comply with ANSI A108.4.

3.12 ADJUSTING AND CLEANING

- A. Remove and replace stonework of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective joints.
 - 3. Stone flooring and joints not matching approved Samples and mockups.
 - 4. Stonework not complying with other requirements indicated.
- B. Replace in a manner that results in stonework matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stonework as work progresses. Remove mortar fins and smears before tooling joints.
- D. Clean stonework after setting and pointing or grouting is complete. Use procedures recommended by stone fabricator for application types.
- E. Apply sealer to cleaned stonework according to sealer manufacturer's written instructions.

3.13 PROTECTION

- A. Prohibit traffic from installed stone for a minimum of 72 hours.
- B. Protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of 3/4 -inch (20-mm) untreated plywood over nonstaining kraft paper.

- END OF SECTION -

- SECTION 09 6423 -**WOOD PARQUET FLOORING (C)**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Factory-finished laminated wood parquet flooring.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 03 3000 "Cast-In-Place Concrete"
- D. Section 03 3500 "Concrete Finishing"
- E. Section 07 2633 "Water Vapor Emission Control Coating (Flooring)"
- F. Section 07 9200 "Joint Sealants".
- G. Section 09 0511 "Concrete Floor Preparation".
- H. Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
- I. Section 09 3013 "Tiling"
- J. Section 09 6566 "Resilient Athletic Flooring".
- K. Section 09 6723 "Resinous Flooring".
- L. Section 09 6800 "Carpeting" including carpet to wood transition components.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [ASTM International \(ASTM\)](#) Publications: (Former American Society for Testing and Materials)
 - 1. F710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring"
- C. [National Wood Flooring Association \(NWFA\)](#)
 - 1. "Installation Guidelines: Wood Flooring"

1.5 SUBMITTALS

- A. General:
 - 1. Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
 - 2. Submit in accordance with Section 01 3300.
- B. Product Data: Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
- C. Product Data: For each type of product specified including:
 - 1. Submit manufacturer's product and maintenance data for each type of wood parquet flooring.
 - a. Certification by wood parquet flooring and adhesive manufacturers that products supplied for flooring installation comply with local regulations controlling use of volatile organic compounds (VOCs).
 - 2. Submit samples in the form of actual sections of wood parquet flooring showing full range of colors and patterns proposed for installation.

1.6 INFORMATIONAL SUBMITTALS:

- A. Warranty: Special warranty specified in this Section.
 - 1. Submit copies of manufacturer's required documentation that installer submitted to manufacturer.

1.7 CLOSEOUT SUBMITTALS:

- A. Submit under provisions of Section 01 1700.
- B. Warranty: Submit specified warranty.

1.8 QUALITY ASSURANCE

- A. Single-Source Responsibility for Flooring: Obtain each type, color and pattern of flooring from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

- B. Installer Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, including specific requirements indicated.
 - 1. Acceptable to or licensed by manufacturer.
- C. Mockups: Install mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PROJECT CONDITIONS

- A. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
 - 1. Conditioning period shall begin not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.
- B. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.
 - 1. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
 - 2. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.
- C. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- D. Install factory-finished wood flooring after other finishing operations, including painting, have been completed. Close spaces to traffic during flooring installation and initial sealing and finishing.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000 "Product Requirements".
- B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 60 degrees F. and 80 degrees F. Store flooring materials on flat surfaces. Move flooring and installation accessories into spaces where they will be installed at least seven (7) days in advance of installation.

1.11 SEQUENCING AND SCHEDULING

- A. Do not install flooring materials over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.12 EXTRA MATERIALS

- A. Refer to Section 01 7843 "Spare Parts"

1.13 WARRANTY

- A. Comply with provisions of Section 01 7700 "Closeout Procedures".

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MANUFACTURERS

- A. Avendra, LLC Preferred Manufactures:
 - 1. None
- B. Approved Manufacturers:
 - 1. "HARO"; Hamberber Flooring GmbH & Co., KG. (314-743-1081)

2.3 WOOD PARQUET FLOORING ("WD-3")

- A. Engineered-Wood, End Cut Parquet Flooring: HPVA EF, except bonding agent contains no urea formaldehyde.
 - 1. Width, Length and Edge Treatment: As standard with manufacturer for product selection indicated.
 - 2. Thickness: 5/8-inch nominal.
 - 3. Construction: 3-ply, with end-grain top wearing layer.
 - 4. Finish: Ultraviolet cured urethane.
- B. Product Selection:
 - 1. Model No.: Refer to Interior "Finish Specifications" Drawings.
 - 2. Species: Refer to Interior "Finish Specifications" Drawings.
 - 3. Size: Refer to Interior "Finish Specifications" Drawings.
 - 4. Color and Finish: Refer to Interior "Finish Specifications" Drawings.

2.4 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

WOOD PARQUET FLOORING

- B. Trowelable Leveling and Patching Compound: Portland-cement-based formulation approved by wood flooring manufacturer.
 - 1. Manufacturers:
 - a. Avendra, LLC Preferred Manufactures:
 - 1) None
 - b. Approved Manufacturers:
 - 1) "K-15 Self-Leveling Underlayment Concrete"; Ardex, Inc.
 - 2) "Levelquick RS Self-Leveling Underlayment"; Custom Building Products
 - 3) "Level-Right"; Maxxon Corporation
- C. Fasteners: As recommended by manufacturer.
- D. Trim: In same specie and grade as wood flooring, finished to match, unless otherwise specifically indicated.
 - 1. Reducer Strip: 2-inches wide, tapered on one side, and in thickness matching wood flooring.
 - 2. Shoe Molding: 7/8-inch by 3/4 -inch quarter-round shape matching wood flooring.
- E. Initial Flooring Treatment Products: Manufacturer's recommended initial floor sealer and treatment product and manufacturer's recommended floor polish.
- F. Other materials, including items not specifically described, but required for a complete and proper installation of wood parquet flooring, shall be only as recommended by the manufacturer of material to which it is applied.

2.5 TRANSITION EDGES

- A. Carpet to Wood Transition components:
 - 1. Refer to Section 09 6800

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
- B. Installer must examine the areas and conditions under which flooring and accessories are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
 - 1. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
 - 2. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Test in accordance with Section 09 0512.
 - 2. If test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511, and install Water Vapor Emission Control Coating as specified in Section 07 2633.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications for preparing substrates to receive products indicated.
- B. Concrete Substrates for materials installed under this specification: Test and prepare concrete substrate.
 - 1. Testing:
 - a. If test results from Section 09 0512 are within limits recommended by flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511 and as recommended by flooring and adhesive manufacturers.
 - b. If test results from Section 09 0512 are not within limits recommended by flooring manufacturer and adhesive materials manufacturer, verify installation of Water Vapor Emission Control Coating as specified in Section 07 2633 is complete.
 - 2. Preparation:
 - a. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
 - 1) Repair damage to Water Vapor Emission Control Coating where occurs and re-test for adhesion as specified in Section 07 2633.
 - b. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - c. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer.
 - 1) Do not use solvents.
- C. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.
 - 1. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Remove coatings, including curing compounds, adhesives, plastics, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush. Surface to receive new flooring shall be prepared, including removal of existing materials not acceptable for proper installation of new materials, as required by manufacturer. Do not use solvents.

- E. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.
- F. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive.
 - 1. Apply in compliance with manufacturer's directions.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 CONCRETE SUBFLOOR

- A. Verify that concrete slabs comply with [ASTM F710](#) and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, residual adhesives, adhesive removers, and other materials whose presence would interfere with bonding of adhesive.
 - a. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by manufacturer, or in accordance with applicable recommendations in the National Wood Flooring Association's Installation Guidelines: Wood Flooring".
 - 2. Finishes of subfloors comply with tolerances and other requirements specified in Section 03 3000 "Cast-In-Place Concrete" and Section 03 3500 "Concrete Finishing" for slabs receiving flooring.
 - 3. Subfloor Moisture Conditions: Before installing flooring Contractor shall verify that Moisture emission rate of not more than **3 lb/1000 sq. ft./24 hours** when tested by calcium chloride moisture test with subfloor temperatures not less than **55 deg F**, or as recommended by manufacturer.
 - a. Perform tests so that each test area does not exceed 200 square feet, and perform not less than two tests in each installation area with test locations evenly spaced in area.
 - 1) Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - 2) Refer to Section 07 2633 "Water Vapor Emission Control Coating"
 - 4. Subfloor Alkalinity Conditions: Before installing flooring Contractor shall verify that a pH range of 5 to 9 when subfloor is wetted with potable water and pHydron paper is applied.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b. Refer to Section 07 2633 "Water Vapor Emission Control Coating"
- B. Grind high spots and fill low spots on concrete substrates to produce a maximum **1/8-inch** deviation in any direction when checked with a **10-foot** straight edge.
 - 1. Refer also to Section 03 3500 "Concrete Finishing" for more restrictive requirements.
- C. If required, prime slabs with moisture-vapor-retarding sealing product recommended in writing by manufacturer, and re-test to confirm acceptable moisture-vapor-transmission rate for flooring installation.

3.4 INSTALLATION - GENERAL:

- A. Install flooring after finishing operations, including painting, have been completed. Moisture content of concrete slabs, building air temperature, and relative humidity must be within limits recommended by flooring manufacturer's directions.

- B. Patch and repair floors to receive flooring for proper installation of flooring and accessories.
- C. Place flooring with adhesive cement in strict compliance with manufacturer's recommendations. Provide expansion space at vertical surfaces, walls and other obstructions. Extend flooring into toe spaces.
- D. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
- E. Maintain overall continuity of color. Where flooring is visible through windows and doorways of adjoining spaces maintain continuity through adjoining spaces.
- F. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of substrate conditions, or other surface imperfections.

3.5 INSTALLATION – WOOD PARQUET FLOORING:

- A. Lay flooring square to room axis unless otherwise indicated.
- B. Match flooring for color and pattern by using material from cartons in same sequence as manufactured and packaged. Cut flooring neatly in and around all fixtures. Broken, cracked, chipped, or deformed flooring units are not acceptable.
- C. Except as specifically indicated lay flooring with grain in tile running in same direction.
- D. Scribe, cut, and fit flooring to butt neatly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings. Leave space for expansion.
- E. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.
- G. Adhere flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.6 ACCESSORIES:

- A. Place reducer strips tightly butted to adjacent materials and bond to substrates with adhesive. Install strips at all unprotected edges of flooring unless otherwise shown.
- B. Place shoe moldings at perimeter of floor areas covering expansion space between flooring and adjoining vertical surfaces, and secure with fasteners or adhesives to adjoining vertical surfaces. Do not fasten to floor or subfloor.

3.7 CLEANING AND PROTECTION:

- A. Perform the following operations immediately after installing wood parquet flooring:

WOOD PARQUET FLOORING

1. Close areas to traffic.
 2. Remove adhesive and other surface blemishes using cleaner recommended by floor covering manufacturer.
 3. Sweep and vacuum floor thoroughly.
 4. Treat floor with manufacturer's recommended initial floor treatment and sealer. Comply with directions for product application and buffing.
 5. Following curing period of sealer product, damp-mop floor and apply initial application of manufacturer's recommended polish.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of product involved.
- C. Do not move heavy and sharp objects directly over wood parquet floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- D. Clean products specified in this Section not more than four days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer. Renew sealer if required. Perform initial maintenance including cleaning and polishing in accordance with manufacturer's instructions.

- END OF SECTION -

- SECTION 09 6500 -

RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes the following:
 - 1. Vinyl composition tile.
 - 2. Sheet vinyl flooring.
 - 3. Resilient base.
 - 4. Solid vinyl transition edges and strips.
 - 5. PVC thresholds.
 - 6. Stair nosings – where indicated on Drawings.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 03 3000 "Cast-In-Place Concrete"
- D. Section 03 3500 "Concrete Finishing"
- E. Section 07 2633 "Water Vapor Emission Control Coating (Flooring)"
- F. Section 07 9200 "Joint Sealants".
- G. Section 09 0511 "Concrete Floor Preparation".
- H. Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
- I. Section 09 3013 "Tiling".
- J. Section 09 6423 "Wood Parquet Flooring (C)"
- K. Section 09 6566 "Resilient Athletic Flooring".

- L. Section 09 6723 "Resinous Flooring".
- M. Section 09 6800 "Carpeting".
- N. Division 14 for Elevators".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- C. [ASTM International](#) Publications:
 - 1. C241 "Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic"
 - 2. C503 "Standard Specification for Marble Dimension Stone (Exterior)"
 - 3. D2047 "Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine"
 - 4. D2240 "Standard Test Method for Rubber Property—Durometer Hardness"
 - 5. D3389 "Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double-Head Abrader)"
 - 6. E648/NFPA 253 "Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source"
 - 7. E662/NFPA 258 "Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials"
 - 8. F710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring"
 - 9. F1066 "Standard Specification for Vinyl Composition Floor Tile"
- D. [Code of Federal Regulations \(CFR\)](#) Publications:
 - 1. 40 [CFR](#) 763 - Asbestos: Appendix A - Transmission Electron Microscopy Analytical Methods

[Occupational Safety & Health Administration \(OSHA\)](#) Regulations:

- 1. [OSHA](#) Regulation 29 [CFR](#) Toxic and Hazardous Substances 1910-1200 Hazard Communication

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:

1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.
 1. Submit manufacturer's product and maintenance data for each type of resilient flooring and accessory.
 - a. Certification by resilient flooring manufacturer that products supplied for flooring installation comply with local regulations controlling use of volatile organic compounds (VOC).
 - b. Asbestos Content: Provide written certification that tile and adhesive materials contain no asbestos of any type of mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 [CFR](#) 763 will be utilized on this Project.
 2. Submit color selection in the form of actual sections of resilient flooring, including accessories, for each type of resilient flooring required showing full range of colors and patterns available.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Flooring: Obtain each type, color and pattern of flooring from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work..
- B. Installer: A firm with not less than five years of successful experience in installation of sheet vinyl flooring systems with chemically welded seams similar to those required for this project and which is certified by manufacturer of the sheet vinyl materials.
- C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Critical Radiant Flux: **0.45 W/sq. cm** or greater when tested per [ASTM](#) E648.
 2. Smoke Density: Maximum specific optical density of 450 or less when tested per [ASTM](#) E662.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver tiles and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- C. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between **50 degrees F.** and **90 degrees F.** Store tile flooring materials on flat surfaces. Move resilient flooring and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.8 PROJECT CONDITIONS

- A. Maintain a minimum temperature of **70 degrees F.** in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than **55 degrees F.**
- B. Do not install resilient flooring until they are at the same temperature as the space where they are to be installed. Close spaces to traffic during resilient flooring installation.

1.9 SEQUENCING AND SCHEDULING

- A. Do not install resilient flooring materials over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.10 EXTRA MATERIALS

- A. Refer to Section 01 7843 "Spare Parts"

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. ASTM D2047 Slip-Resistance: All Resilient Flooring Products shall meet or exceed Federal ADA recommendations of minimum Coefficient Of Friction of 0.6 for flat surfaces and 0.8 for sloped surfaces.
- C. Critical Radiant Flux (CRF): Minimum **0.45 watt** per **square centimeter**, when tested in accordance with ASTM E 648 or NFPA 253.

2.2 MANUFACTURERS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. Armstrong World Industries, Inc. (800-442-4212 x 2)
- B. Approved Manufacturers:
 - 1. Tarkett Inc., a Tarkett Sommer Company (800-877-8453)

2.3 VINYL COMPOSITION TILES

- A. Product, Size and Color: Refer to Interior "Finish Specifications" Drawings.
 - 1. Drawing Designation: ("VCT-1")
- B. All vinyl tile shall be the maximum extent possible of a single batch number.

RESILIENT FLOORING

1. Tile should have uniform disbursement of color and texture throughout the thickness of the tile.
2. Comply with [ASTM](#) F1066, Composition 1 (nonasbestos formulated).

2.4 SHEET VINYL FLOORING

- A. Avendra, LLC Preferred Manufacturers:
 1. Armstrong World Industries, Inc. (800-442-4212 x 2)
- B. Approved Manufacturers:
 1. Mannington Mills, Inc. (706-629-7301)
 2. Substitution as approved by Marriott International
- C. All sheet vinyl shall be the maximum extent possible of a single batch number.
- D. Sheet Vinyl:
 1. Vinyl sheet flooring shall meet ASTM F1303, Type I, Grade 1, with Class B backing.
 2. Sheet Width: Refer to Interior "Finish Specifications" Drawings
 3. Nominal Thickness: Refer to Interior "Finish Specifications" Drawings
 4. Size: As shown on Drawings.
 5. Color and Pattern: As shown in Interior "Finish Specifications" Drawings
 6. Seams: Install seamless installation unless otherwise approved by Owner's Representative.
 7. Static Load Limit: ASTM F970 (modified) 750 psi (52.73 kg/sq cm) (Modified by specifying a higher load on a smaller diameter tip. All other conditions are standard).
 8. Meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
 - a. Flame Spread Rating: 75 or less by ASTM E84.
 - b. Smoke Density: Less than 450 by ASTM E662.
 - c. Critical Radiant Flux: 0.45 minimum by ASTM E468.

2.5 RESILIENT AND RUBBER BASE

- A. Avendra, LLC Preferred Manufacturers:
 1. IPC Door and Wall Protection Systems, Inpro Corp. (800-543-1729)
- B. Approved Manufacturers:
 1. Johnsonite (800-899-8916).
 2. Burke Mercer Flooring Products, A Division of Burke Industries (800-669-7010).
- C. Resilient and Rubber bases shall be size as shown in Interior "Finish Specifications" Drawings.
 1. Provide cove type at sheet vinyl, resilient tile flooring, and other hard surfaces.
 2. Job mitering of corners will not be permitted.
- D. Drawing Designations:
 1. "RB-3"
 2. "RB-5"

3. "RB-6"
4. "RB-7"
5. "RB-8"

- E. Model: Refer to Interior "Finish Specifications" Drawings.
- F. Size: Refer to Interior "Finish Specifications" Drawings.
- G. Color: Refer to Interior "Finish Specifications" Drawings.

2.6 PVC THRESHOLD (COURTYARD)

- A. Avendra, LLC Preferred Manufacturers:
1. None
- B. Approved Manufacturers:
1. "Carpet Insert Threshold Mouldings"; Johnsonite (800-899-8916).
 - a. Guestroom Entry Door: Model VT-XX-M6, 1-3/4 -inch wide by 1/2 -inch thick.
 - b. Guestroom Connecting Door: Model VT-XX-M2, 5-1/2 -inch wide by 1/2 -inch thick.
 2. Approved Substitution by Marriott International
- C. Manufactured from a homogeneous composition of polyvinyl chloride (PVC), high quality additives, and colorants. All Threshold Mouldings shall comply with A.D.A. requirements of Section 4.5.2 Changes of Level. Standard formulation exceeds [ASTM](#) E648 Class 1 Flammability requirements.
1. Hardness - [ASTM](#) D2240 - Not less than 85 Shore A
 2. Abrasion Resistance - [ASTM](#) D3389 - 0.22 mg/cycle
 3. Slip Resistance - [ASTM](#) D2047 - Exceeds Federal Standards and ADA requirements of .6 for flat surfaces.
 4. Fire Resistance:
 - a. [ASTM](#) E648/NFPA 253 (Critical Radiant Flux) - Class 1.
 - b. [ASTM](#) E662/NFPA 258 (Smoke Density) - 450 or less.
 5. Adhesive: As recommended by Manufacturer for use intended.
 6. Color: Refer to Interior "Finish Specifications" Drawings for color and other additional requirements.

2.7 PVC THRESHOLD (RESIDENCE INN)

- A. Avendra, LLC Preferred Manufacturers:
1. None
- B. Approved Manufacturers:
1. "Carpet Insert Threshold Mouldings"; Johnsonite (800-899-8916) Representative: (856-912-1896).
 - a. Guestroom Entry Door: "Model VT-XX-M6", 1-3/4 -inch wide by 1/2 -inch thick.
 - 1) Carpet to Carpet.

- b. Guestroom Entry Door: "Profile Model CD-XX-A (1-1/2 -inch wide) w/Single Flange Track Base Model MT-00-A". Install long leg of track base under tile.
 - 1) Carpet to Ceramic Tile.
 - c. Guestroom Connecting Door: "Model VT-XX-M2", 5-1/2 -inch wide by 1/2 -inch thick.
 - 1) Connecting door threshold.
 - 2. Approved Substitution by Marriott International
- C. Manufactured from a homogeneous composition of polyvinyl chloride (PVC), high quality additives, and colorants. All Threshold Mouldings shall comply with A.D.A. requirements of Section 4.5.2 Changes of Level. Standard formulation exceeds [ASTM](#) E648 Class 1 Flammability requirements.
 - 1. Hardness - [ASTM](#) D2240 - Not less than 85 Shore A
 - 2. Abrasion Resistance - [ASTM](#) D3389 - 0.22 mg/cycle
 - 3. Slip Resistance - [ASTM](#) D2047 - Exceeds Federal Standards and ADA requirements of 0.6 for flat surfaces.
 - 4. Fire Resistance:
 - a. [ASTM](#) E648/NFPA 253 (Critical Radiant Flux) - Class 1.
 - b. [ASTM](#) E662/NFPA 258 (Smoke Density) - 450 or less.
 - 5. Adhesive: As recommended by Manufacturer for use intended.
 - 6. Color: Refer to Interior "Finish Specifications" Drawings for color and other additional requirements.

2.8 TRANSITION EDGES AND STRIPS

- A. Avendra, LLC Preferred Manufacturers:
 - 1. Resilient Edge Trims, Transitions and Strips:
 - a. None
 - 2. Straight Metal Edge Trims:
 - a. None
 - 3. Curved Metal Edge Trims:
 - a. None
- B. Approved Manufacturers:
 - 1. Resilient Edge Trims, Transitions and Strips:
 - a. Marley Flexco Co. , A Soflex Company (800-633-3151)
 - b. Johnsonite (800-899-8916)
 - c. Burke Mercer Flooring Products, A Division of Burke Industries (800-669-7010).
 - 2. Straight Metal Edge Trims:
 - a. Schluter System (800-574-8481)
 - b. Ceramic Tool Company, Inc. (CTC) (800-236-5230)
 - 3. Curved Metal Edge Trims:
 - a. Schluter Systems (800-574-8481)
- C. Model, Size and Color: Refer to Interior "Finish Specifications" Drawings.

D. Furnish transition edges at the following locations and as indicated on drawings:

1. Vinyl Composition Tile to Concrete
2. Vinyl Composition Tile to Carpet
3. Sheet Vinyl Flooring to Concrete
4. Sheet Vinyl Flooring to Carpet
5. Carpet to Carpet
 - a. Including, but not limited to:
 - 1) "RB-1"
 - 2) "RB-2"
6. Carpet to Carpet (Where thickness varies)
7. Carpet to Ceramic Tile:
 - a. Including, but not limited to:
 - 1) "RB-4"
8. Refer to Drawings
 - a. Including, but not limited to "Finish Specifications" Drawings.

2.9 RESILIENT STAIR ACCESSORIES

- A. Application: Where indicated on Drawings.
- B. Stair Nosings:
 1. Avendra, LLC Preferred Manufacturers:
 - a. None.
 2. Approved Manufacturers:
 - a. Burke Mercer Flooring Products, a Division of Burke Industries (800-669-7010).
 - b. Johnsonite (800-899-8916).
 - c. Roppe Corporation (800-537-9527).
 3. Drawing designation: "RB-9"
- C. Model and Size: Refer to Interior "Finish Specifications" Drawings.
- D. Color: As selected by Architect from manufacturers full range of colors.
- E. Code compliance: Including, but not limited to;
 1. Phoenix Building Code, Section 1025.11.3

2.10 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- C. Concrete Leveling and Patching compounds:
 1. For areas up to 4 square -feet:
 - a. Feather finish, use to smooth ridges, fill cracks, gouges and joints.

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- 1) "SD-F"; Ardex (724-203-5000).
- 2) "Planiprep FF", Mapei Corp. (800-426-2734).
- b. Trowelable underlayment patch for thickness from feather edge to 3 -inch without aggregate
 - 1) "Quickpatch"; Mapei Corp. (800-426-2734).
- c. Trowelable underlayment patch for thickness up to 1/2 -inch without aggregate; up to 1 inch with aggregate. Can be feather edged.
 - 1) "SD-P/ Primer P-82"; Ardex (724-203-5000).
- 2. For areas exceeding 4 square -feet:
 - a. Self-leveling, pourable or pumpable underlayment for thicknesses up to 5 -inches. Can be feather edged.
 - 1) "K-15/Primer P-51"; Ardex (724-203-5000).
 - 2) "Novaplan 2/Primer", Mapei Corp., (800-426-2734).
 - a) Refer to product datasheet for specific requirements based on substrates.

D. Concrete Slab Primer:

- 1. Vinyl Composition Tiles:
 - a. Non-staining type as recommended by flooring manufacturer.
- 2. Sheet Vinyl Flooring:
 - a. Avendra, LLC Preferred Manufacturers:
 - 1) "S-185 Latex Primer and Additive"; Armstrong World Industries, Inc. (800-442-4212 x 2).
 - b. Approved Manufacturers:
 - 1) Approved Substitution.

E. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer for applications indicated.

- 1. Vinyl Composition Tiles:
 - a. As recommended by flooring manufacturer.
- 2. Sheet Vinyl Flooring:
 - a. Avendra, LLC Preferred Manufacturers:
 - 1) "S-184 Fast-Setting Cement-Based Patch and Skim Coat"; Armstrong World Industries, Inc. (800-442-4212 x 2)
 - b. Approved Manufacturers:
 - 1) Approved Substitution.

F. Sheet Vinyl Adhesives:

- 1. Avendra, LLC Preferred Manufacturers:
 - a. "S-599 Premium Vinyl-Back Flooring Adhesive"; Armstrong World Industries, Inc. (800-442-4212 x 2)
- 2. Approved Manufacturers:
 - a. Approved Substitution.

G. Sheet Vinyl Seam Sealing Adhesive:

- 1. Avendra, LLC Preferred Manufacturers:

- a. "S-553 Seam Sealing Adhesive "; Armstrong World Industries, Inc. (800-442-4212 x 2)
 - 2. Approved Manufacturers:
 - a. Approved Substitution.
- H. Resilient Floor Tile Adhesives: Provide water-resistant type recommended by tile manufacturer to suit floor tile and substrate conditions indicated.
- 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. "Ultrabond ECO 360"; Mapei Corp. (800-426-2734)
 - b. Approved Substitution as approved by tile manufacturer.
- I. Resilient Base Adhesives to be Non-Toxic, Low Odor, and Solvent Free with no alcohol, glycol, or ammonia. Adhesive shall be antimicrobial with no hazardous vapors and contain no carcinogenic materials, per OSHA Regulation 29 [CFR](#) 1910-1200. Provide product as recommended for intended installation, as approved by resilient base manufacturer.
- 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. "Ultrabond ECO 575"; Mapei Corp. (800-426-2734)
 - b. Approved Substitution as approved by resilient base manufacturer.
- J. Resilient Floor Tile Adhesives: Provide water-resistant type recommended by tile manufacturer to suit floor tile and substrate conditions indicated.
- K. Other materials, including edge strips not specifically described, but required for a complete and proper installation of resilient flooring, shall be only as recommended by the manufacturer of material to which it is applied.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer must examine the areas and conditions under which resilient flooring and accessories are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
 - 1. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
 - 2. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.

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1. Test in accordance with Section 09 0512.
2. If test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511, and install Water Vapor Emission Control Coating as specified in Section 07 2633.

3.2 CONCRETE SUBFLOORS OR GYPSUM CEMENT FLOOR UNDERLAYMENT:

- A. Verify that concrete slabs comply with [ASTM](#) F710 and the following:
 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, residual adhesives, adhesive removers, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by manufacturer.
 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section, "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 3. Subfloor Moisture Conditions: Before installing flooring Contractor shall verify that Moisture emission rate of not more than **3 lb/1000 sq. ft./24** hours when tested by calcium chloride moisture test in compliance with [CRI](#) 104, 6.2.1, with subfloor temperatures not less than **55 deg F**, or as recommended by manufacturer.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b. Refer to Section 07 2633 "Water Vapor Emission Control Coating"
 4. Subfloor Alkalinity Conditions: Before installing flooring Contractor shall verify that a pH range of 5 to 9 when subfloor is wetted with potable water and pHdriion paper is applied.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b. Refer to Section 07 2633 "Water Vapor Emission Control Coating"

3.3 PREPARATION

- A. General: Comply with manufacturer's installation specifications for preparing substrates to receive products indicated.
 1. Resilient Floor Tile Adhesives: Provide water-resistant type recommended by tile manufacturer to suit floor tile and substrate conditions indicated.
 2. Comply with Armstrong Guaranteed Installation Manual F-5061, or equivalent by other listed manufacturers.
- B. Prepare substrates according to manufacturer's written instructions to ensure adhesion of products.
- C. Concrete Substrates for materials installed under this specification: Test and prepare concrete substrate.
 1. Testing:
 - a. If test results from Section 09 0512 are within limits recommended by flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511 and as recommended by flooring and adhesive manufacturers.
 - b. If test results from Section 09 0512 are not within limits recommended by flooring manufacturer and adhesive materials manufacturer, verify installation of Water Vapor Emission Control Coating as specified in Section 07 2633 is complete.
 2. Preparation:

- a. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
 - 1) Repair damage to Water Vapor Emission Control Coating where occurs and re-test for adhesion as specified in Section 07 2633.
 - b. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - c. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer.
 - 1) Do not use solvents.
- D. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.
 - 1. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. This Contractor to remove coatings, including curing compounds, adhesives, plastics, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
 - 1. Surface to receive new flooring shall be prepared, including removal of existing materials not acceptable for proper installation of new materials, as required by manufacturer.
 - a. Do not use solvents.
 - 2. Prep floor according to [ASTM](#) F710 criteria.
- F. Slab Primers:
 - 1. Gypsum Cement Floor Underlayment: Apply Armstrong "S-185 Latex Primer and Additive", or approved substitution, to gypsum subfloor liberally with a short nap paint roller or a coarse fiber brush.
 - a. Avoid puddling.
 - b. Use at full strength, DO NOT DILUTE.
 - 2. Allow to dry thoroughly before skimming with floor patch
- G. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive.
 - 1. Apply in compliance with manufacturer's directions.
- H. Underlayment or Leveling Compound: Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors. All rough areas, projections, ridges, and bumps shall be removed.
 - 1. Vinyl Composition Floor Tile: Apply underlayment or leveling compound in compliance with manufacturer's directions.
 - 2. Sheet Vinyl Flooring: Skim coat the entire subfloor with Armstrong "S-184 Fast-Setting Cement-Based Patch and Skim Coat", or approved substitution, using a smooth-edge finishing trowel filling in the recessed areas to provide a smooth finished substrate to receive the sheet vinyl.
- I. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.

1. Refer also to Section 03 3500 "Concrete Finishing" for more restrictive requirements.

3.4 INSTALLATION - GENERAL

- A. Install flooring after finishing operations, including painting, have been completed.
 1. Moisture content of concrete slabs, building air temperature, and relative humidity must be within limits recommended by flooring manufacturer's directions.
- B. Patch and repair floors and walls to receive flooring for proper installation of flooring, stair accessories, and base.
- C. Place flooring with adhesive cement in strict compliance with manufacturer's recommendations. Butt tightly to vertical surfaces and edgings.
 1. Scribe around obstructions and to produce neat joints, laid tight, even, and straight. Extend flooring into toe spaces.
- D. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor.
 1. Use chalk or other non-permanent marking device.
- E. Install flooring on covers for telephone and electrical ducts and other such items as occur within finished floor areas.
- F. Maintain overall continuity of color and pattern with pieces of flooring installed in these covers. Tightly cement edges to perimeter of floor around covers and to covers.
- G. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

3.5 INSTALLATION - VINYL COMPOSITION TILE FLOORS

- A. Lay tile from center marks established from center of area so that tile at opposite edges of the area are of equal width.
 1. Adjust as necessary to avoid use of cut widths less than 1/2 tile at edge perimeters.
 2. Lay tile square to room axis unless otherwise indicated.
- B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged.
 1. Cut tile neatly in and around all fixtures.
 2. Broken, cracked, chipped, or deformed tiles are not acceptable.
 3. Lay tile with grain in tile running in same direction.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.
- F. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.6 INSTALLATION – SHEET VINYL FLOORING

- A. General: Comply with sheet vinyl floor covering manufacturer's written installation instructions.
 - 1. Install flooring in strict accordance with the latest edition of "Armstrong Guaranteed Installation System", F-5061, or equivalent by other listed manufacturers.
- B. Unroll sheet vinyl floor coverings and allow them to stabilize before cutting and fitting, if recommended in writing by manufacturer.
- C. Lay out sheet vinyl floor coverings to comply with the following requirements:
 - 1. Maintain uniformity of sheet vinyl floor covering direction.
 - 2. Arrange for a minimum number of seams and place them in inconspicuous and low-traffic areas, and not less than 6 -inches away from parallel joints in flooring substrates.
 - 3. Match edges of sheet vinyl floor coverings for color shading and pattern at sump according to manufacturer's written recommendations.
 - 4. Avoid cross seams.
- D. Do not reverse pieces (TM edge to non-TM edge). If a seam is needed, seams should be positioned so that the ends of the planks are offset 3 -inch to 6 -inch. Install with Full Spread of Armstrong "S-575" adhesive using a fine notched trowel 1/32 -inch deep x 1/16 -inch wide x 5/64 -inch apart.
- E. Install flooring wall-to-wall before the installation of floor-set cabinets, casework, furniture, equipment, moveable partitions and similar moveable objects.
- F. Scribe, cut, and fit or flash cove to permanent fixtures, built-in furniture and cabinets, pipes and outlets, and permanent columns, walls, and partitions as shown on Drawings.
- G. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
- H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor.
 - 1. Use chalk or other nonpermanent, nonstaining marking device.
- I. Install sheet vinyl floor coverings on covers for telephone and electrical ducts, and similar items in finished floor areas.
 - 1. Maintain overall continuity of color and pattern with pieces of flooring installed on covers.
 - 2. Tightly adhere edges to perimeter of floor around covers and to covers.
- J. Adhere sheet vinyl floor coverings to flooring substrates to comply with floor covering manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.

1. Produce completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- K. Chemically-Welded Seams: Chemically weld seams with Armstrong "S-553 Seam Sealer" into a seamless floor covering.
 1. Prepare, weld, and finish seams according to manufacturers written instructions and ASTM F1516 to produce surfaces flush with adjoining floor covering surfaces.
- L. Hand roll sheet vinyl floor coverings directions with a 100 pound roller in both directions from center out to embed floor coverings in full spread of adhesive and eliminate trapped air.
 1. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.

3.7 INSTALLATION - RESILIENT WALL BASE

- A. At areas where base is required, apply resilient base to walls, columns, pilasters, casework, and other permanent fixtures, as coordinated with type of flooring.
 1. Install base in as long lengths as practicable.
 2. Tightly bond base to backing throughout the length of each piece with continuous contact at horizontal and vertical surfaces.
 3. On irregular surfaces, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- B. Job-Formed Corners:
 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
 2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.8 INSTALLATION - ACCESSORIES:

- A. Place resilient edge strips tightly butted to adjacent materials of type indicated and bond to substrates with adhesive. Install edging strips at all unprotected edges of flooring unless otherwise shown. Apply resilient accessories to stairs and risers as indicated and according to manufacturer's installation instructions.
- B. Stair Nosings:
 1. Use stair-tread-nose filler, according to resilient tread manufacturer's written instructions, to fill nosing substrates that do not conform to tread contours.
 2. Apply resilient products to stairs as indicated and according to manufacturer's written installation instructions.
 3. Refer to Drawings for locations.

3.9 CLEANING AND PROTECTION:

- A. Perform the following operations immediately after installing resilient floor coverings:

1. Remove adhesive and other surface blemishes using cleaner recommended by floor covering manufacturer.
 2. Sweep or vacuum floor thoroughly.
 3. Do not wash floor covering until after time period recommended by floor covering manufacturer.
 4. Damp-mop floor to remove marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of resilient product involved.
- C. Clean products specified in this Section not more than four days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer. Strip protective floor polish that was applied after completing installation, prior to cleaning.
- D. Do not move heavy and sharp objects directly over resilient floor coverings.
1. Place plywood or hardboard panels over floor coverings and under objects while they are being moved.
 2. Slide or roll objects over panels without moving panels.

3.10 FINISHING:

- A. After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories.
1. For resilient tile, apply wax and buff with type of wax, number of coats, and buffing procedures in compliance with flooring manufacturer's instructions.
 2. Vinyl Composition Tile: Apply wax and buff with type of wax, number of coats, and buffing procedures in compliance with flooring manufacturer's instructions.
- B. Sheet Vinyl Flooring: Apply two (2) coats of a high quality acrylic floor matte shine finish (high gloss is not permitted) such as "Taski's Ombra Matte Shine Floor Finish" by Lever Industrial (800-827-5487), or approved substitution by Ecolabs, as approved by flooring manufacturer.

- END OF SECTION -

- SECTION 09 6566 -**RESILIENT ATHLETIC FLOORING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient Athletic Flooring (Woven vinyl synthetic) – roll goods
 - 2. Adhesive and accessories.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 03 3000 "Cast-In-Place Concrete".
- D. Section 03 3500 "Concrete Finishing".
- E. Section 07 2633 "Water Vapor Emission Control Coating (Flooring)".
- F. Section 07 9200 "Joint Sealants".
- G. Section 09 0511 "Concrete Floor Preparation".
- H. Section 09 0512 "Concrete Floor Moisture Content and pH Testing".
- I. Section 09 3013 "Tiling".
- J. Section 09 6423 "Wood Parquet Flooring (C)".
- K. Section 09 6723 "Resinous Flooring".
- L. Section 09 6800 "Carpeting".
- M. Division 14 for Elevators.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- C. [ASTM International \(ASTM\)](#) Publications: (Former American Society for Testing and Materials)
 - 1. D2047 "Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine"
 - 2. D2240 "Standard Test Method for Rubber Property—Durometer Hardness"
 - 3. D5516 "Standard Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures"
 - 4. E648/NFPA 253 "Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source"
 - 5. E662/NFPA 258 "Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials"
 - 6. E1745 "Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs"
 - 7. F710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring"
 - 8. F970-00 "Standard Test Method for Static Load Limit"
 - 9. F1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride"
 - 10. G21-96 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi"
- D. Occupational Safety & Health Administration (OSHA) Regulations:
 - 1. [OSHA](#) Regulation 29 [CFR](#) Toxic and Hazardous Substances 1910-1200 Hazard Communication

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.
 - 1. Submit manufacturer's product and maintenance data for each type of Resilient Athletic Flooring and accessory.

RESILIENT ATHLETIC FLOORING

- a. Certification by Resilient Athletic Flooring manufacturer that products supplied for flooring installation comply with local regulations controlling use of volatile organic compounds (VOCs).
- F. Submit color selection in the form of actual sections of Resilient Athletic Flooring, including accessories, for each type of Resilient Athletic Flooring required showing full range of colors and patterns available.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Flooring: Obtain each type, color and pattern of flooring from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.
- B. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per [ASTM E648](#).
 - 2. Smoke Density: Maximum specific optical density of 450 or less when tested per [ASTM E662](#).

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver Resilient Athletic Flooring and installation accessories to Project site in original manufacturer's unopened containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- C. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 degrees F. and 90 degrees F. Store flooring materials on flat surfaces. Move Resilient Athletic Flooring and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.8 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 degrees F. in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 degrees F.
- B. Do not install Resilient Athletic Flooring until they are at the same temperature as the space where they are to be installed. Close spaces to traffic during Resilient Athletic Flooring installation.

1.9 SEQUENCING AND SCHEDULING

- A. Do not install Resilient Athletic Flooring materials over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.10 EXTRA MATERIAL

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sheet Flooring: Furnish not less than **10 linear feet (3 linear m)** for every **500 linear feet (150 linear m)** or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet flooring installed.
 - a. Refer also to Section 01 7843 "Spare Parts"

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. ASTM D2047 Slip-Resistance: All Resilient Flooring Products shall meet or exceed Federal ADA recommendations of minimum Coefficient Of Friction of 0.6 for flat surfaces and 0.8 for sloped surfaces.
- C. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.

2.2 MANUFACTURERS

- A. Avendra, LLC Preferred Manufactures:
 - 1. None
- B. Approved Manufacturers:
 - 1. Missoni, www.bolon.com, www.architonic.com
 - 2. Mondo America Inc. (800-361-3747).
 - 3. ECOsurfaces Commercial Flooring (877-326-7873).
 - 4. Johnsonite (800-899-8916).

2.3 RESILIENT ATHLETIC FLOORING

- A. Product, Size, Thickness, Finish and Color: Refer to Interior Finish Specifications Drawings.
 - 1. Drawing Designation: ("VF-1").
- B. All Resilient Athletic Flooring shall be the maximum extent possible of a single batch number.

2.4 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: to be supplied and/or recommended and approved by rubber athletic flooring Manufacturer for applications indicated.

RESILIENT ATHLETIC FLOORING

- C. Concrete Leveling and Patching compounds:
1. For areas up to 4 square -feet:
 - a. Feather finish, use to smooth ridges, fill cracks, gouges and joints.
 - 1) "SD-F"; Ardex (724-203-5000)
 - b. Trowelable underlayment patch for thickness up to 1/2 -inch without aggregate; up to 1 inch with aggregate. Can be feather edged.
 - 1) "SD-P/ Primer P-82"; Ardex (724-203-5000)
 2. For areas exceeding 4 square -feet:
 - a. Self-leveling, pourable or pumpable underlayment for thicknesses up to 5 -inches. Can be feather edged.
 - 1) "K-15/Primer P-51"; Ardex (724-203-5000)
- D. Resilient Athletic Flooring Adhesives to be certified by the flooring manufacturer to suit flooring and substrate conditions.
1. Mapei ECO 350, Vinyl acrylic adhesive.
- E. Other materials, including edge strips not specifically described, but required for a complete and proper installation of Resilient Sport Flooring, shall be only as recommended by the manufacturer of material to which it is applied.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer must examine the areas and conditions under which resilient flooring and accessories are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
1. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
 2. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
1. Test in accordance with Section 09 0512.
 2. If test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511, and install Water Vapor Emission Control Coating as specified in Section 07 2633.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications for preparing substrates to receive products indicated.
- B. Prepare substrates according to manufacturer's written instructions to ensure adhesion of products.
- C. Concrete Substrates for materials installed under this specification: Test and prepare concrete substrate.
 - 1. Testing:
 - a. If test results from Section 09 0512 are within limits recommended by flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511 and as recommended by flooring and adhesive manufacturers.
 - b. If test results from Section 09 0512 are not within limits recommended by flooring manufacturer and adhesive materials manufacturer, verify installation of Water Vapor Emission Control Coating as specified in Section 07 2633 is complete.
 - 2. Preparation:
 - a. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
 - 1) Repair damage to Water Vapor Emission Control Coating where occurs and re-test for adhesion as specified in Section 07 2633.
 - b. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - c. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer.
 - 1) Do not use solvents.
- D. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. This Contractor to remove coatings, including curing compounds, adhesives, plastics, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush. Surface to receive new flooring shall be prepared, including removal of existing materials not acceptable for proper installation of new materials, as required by manufacturer. Do not use solvents.
 - 1. Prep floor according to [ASTM](#) F710 criteria.
- F. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.
 - 1. Refer also to Section 03 3500 "Concrete Finishing" for more restrictive requirements.
- G. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive.
 - 1. Apply in compliance with manufacturer's directions.

3.3 CONCRETE SUBFLOORS

- A. Concrete subfloors to be placed a minimum of twenty-eight (28) days prior to the installation of rubber athletic flooring.
- B. Verify that concrete slabs comply with [ASTM](#) F710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, residual adhesives, adhesive removers, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by manufacturer.
- C. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section, "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 1. Subfloor Moisture Conditions: Before installing flooring Contractor shall verify that Moisture emission rate of not more than **3 lb/1000 sq. ft./24** hours when tested by calcium chloride moisture test in compliance with [CRI](#) 104, 6.2.1 and does not exceed the capacity of the specified adhesive, with subfloor temperatures not less than **55 deg F**, or as recommended by manufacturer.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b. Refer to Section 07 2633 "Water Vapor Emission Control Coating"
 - 2. Subfloor Alkalinity Conditions: Before installing flooring Contractor shall verify that a pH range of 7 to 8.5 when subfloor is wetted with potable water and pHydration paper is applied.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b. Refer to Section 07 2633 "Water Vapor Emission Control Coating"

3.4 INSTALLATION

- A. Install flooring after finishing operations, including painting, have been completed. Moisture content of concrete slabs, building air temperature, and relative humidity must be within limits recommended by flooring manufacturer's directions.
- B. Patch and repair floors and walls to receive flooring for proper installation of flooring, stair accessories, and base.
- C. Place flooring with adhesive cement in strict compliance with manufacturer's recommendations. Butt tightly to vertical surfaces and edgings. Scribe around obstructions and to produce neat joints, laid tight, even, and straight. Extend flooring into toe spaces.
- D. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
- E. Install flooring on covers for telephone and electrical ducts and other such items as occur within finished floor areas.
- F. Maintain overall continuity of color and pattern with pieces of flooring installed in these covers. Tightly cement edges to perimeter of floor around covers and to covers.
- G. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing resilient floor coverings:
 - 1. Remove adhesive and other surface blemishes using cleaner recommended by floor covering manufacturer.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor covering until after time period recommended by floor covering manufacturer.
 - 4. Initial cleaning should only be performed 72 hours after the rubber athletic surface has been completely installed.
- B. Damp-mop floor to remove marks and soil.
- C. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of resilient product involved.
- D. Initial cleaning should only be performed 72 hours after the rubber athletic surface has been completely installed.
- E. Clean products specified in this Section not more than four days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer. Strip protective floor polish that was applied after completing installation, prior to cleaning.
- F. Do not move heavy and sharp objects directly over floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.

3.6 FINISHING:

- A. After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories in accordance with Manufacturer's recommendations.

- END OF SECTION -

- SECTION 09 6723 -**RESINOUS FLOORING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Including Underlayments, waterproofing membranes, primers, fillers, and other applied materials used as Underlayments, prime, body coat and finish coats, and the application of these materials for the following:
 - a. Industrial Decorative Resinous flooring systems.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 03 3000 "Cast-in-Place Concrete" for Concrete slab substrate.
- D. Section 03 3500 "Concrete Finishing"
- E. Section 07 2633 "Water Vapor Emission Control Coating (Flooring)".
- F. Section 07 9200 "Joint Sealants".
- G. Section 09 0511 "Concrete Floor Preparation".
- H. Section 09 0512 "Concrete Floor Moisture Content & pH Testing".
- I. Section 09 3013 "Tiling" for flooring finishing, edge protection and transitions strips.
- J. Section 09 6423 "Wood Parquet Flooring (C)".
- K. Section 09 6566 "Resilient Athletic Flooring".
- L. Section 09 6800 "Carpeting".
- M. Section 09 9600 "High Performance Coatings" for Epoxy floor finish (EF-2).

- N. Section 14 2100 "Electric Traction Elevators".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- C. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine, 2004.
- D. NACE No. 6/SSPC-SP 13 - Surface Preparation of Concrete.
- E. ACI 308 – Standard Practice for Curing Concrete.
- F. ACI 302.1R-80 - Guide for Concrete Floor and Slab Construction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- C. Samples for Initial Selection: For each type of exposed finish required.
- D. Samples for Verification: For each resinous flooring system required, 6 -inches (150 mm) square, applied to a rigid backing by Installer for this Project.
- E. Product Schedule: For resinous flooring, use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
 2. Contractor shall be an established firm regularly engaged in satisfactory installation of similar materials and shall provide a list of 3 projects of similar nature and complexity completed in the last (15) fifteen years. Contractor shall provide a letter of certification by manufacturer that Contractor is a current qualified installer.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Apply full-thickness mockups on 48-inch (1200-mm-) square floor area selected by Architect.
 - a. Include 48-inch (1200-mm) length of integral cove base with inside and outside corner.
 2. Simulate finished lighting conditions for Architect's review of mockups.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion and approved by Architect.
- D. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- C. Materials shall be stored indoors, protected from damage, moisture, direct sunlight and temperatures below 50 degrees F or above 80 degrees F.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- D. Coordinate flooring work with other trades to ensure adequate illumination, ventilation, and dust free environment during application and curing of flooring.
- E. Comply with material manufacturer's recommended temperature limitations for flooring application.

1.11 WARRANTY:

- A. Contractor shall furnish a written warranty covering both material and workmanship for a period of five (5) year from date of installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Slip Resistant Coefficient of Friction: **COF of >0.6** when wet.

2.2 INDUSTRIAL DECORATIVE RESINOUS FLOORING, MATERIAL

- A. Basis of Design:
 - 1. Subject to compliance with requirements, provide **Selby brand, Selbatwede 41** system products by **BASF**, www.basf.com as specified or comparable products by one of the following or as indicated on the Drawings or Finish Schedule
 - 2. Tnemec, DECO-TROWEL®, Series 223, Color Q208, www.tnemec.com .
- B. General: Two component **100 percent** solids epoxy-resin binder with colored quartz aggregate and clear finish coats.
- C. Industrial Decorative (Epoxy) Resinous Flooring: Abrasion-, impact- and chemical-resistant, Fuel resistant, industrial-aggregate-filled, resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.
 - 1. Color and Pattern:
 - a. As selected by Architect from manufacturer's full range.
 - 1) Refer to Interior Drawings.
 - 2. Wearing Surface: Textured for slip resistance meeting specified value.
 - a. Slip Resistant Coefficient of Friction: **COF of >0.6** when wet.

RESINOUS FLOORING

D. Application assembly:

1. Primer: Selby A750/B725.
 - a. Recommended DFT: 250 ft² / gallon.
2. Mortar Slurry Base Receiving Coat, Vertical: Selby A750/B725.
 - a. Multi coat system combining Parts A and B in required ratio for slurry coat.
 - b. Color: Match floor
 - c. Recommended DFT: As required by manufacturer for integral cove base
3. Mortar Slurry Base Receiving Coat, Horizontal (Initial application): Selby A750/B725
 - a. Multi coat system combining Parts A and B in required ratio for slurry coat with broadcasts.
 - b. Color: As selected by Architect.
 - c. Recommended DFT: 160 ft² / gallon.
4. Broadcast aggregate: Selby A750/B725 Aggregate
 - a. Colored aggregate quartz
 - b. Color: As selected by Architect.
 - c. Recommended DFT:
 - 1) Entire floor shall be saturated with aggregate.
5. Slurry, Horizontal: (2nd application): Selby A750/B725
 - a. Multi coat system combining Parts A and B in required ratio for slurry coat with broadcasts.
 - b. Color: As selected by Architect.
 - c. Recommended DFT: 160 ft² / gallon.
6. Broadcast aggregate (2nd application): Selby A750/B725 Aggregate
 - a. Colored aggregate quartz
 - b. Color: As selected by Architect.
 - c. Recommended DFT:
 - 1) Entire floor shall be saturated with aggregate.
7. Grout clear coating: Initial coating
 - a. Product: Selby A750/B725
 - b. Recommended DFT: 80 – 100 ft² / gallon (2-2.5m²/L)
8. Finish clear coating: Final coating
 - a. Product: Selby A750/B725
 - b. Recommended DFT: 250 ft² / gallon (6.25m²/L)

E. Physical Properties. Epoxy Flooring Systems shall comply with the following minimum test standards:

Compressive Strength, ASTM C 579	12,300 psi
Tensile Strength, ASTM D 638	1,160psi
Flexural Strength, ASTM D 790	4,600psi
Indentation, MIL-D-3134 or MIL-D 24613	24 hrs. residual 0.008 in.
Impact Resistance, MIL-D-3134 or MIL-D-24613	No chipping, cracking or delamination
Fire Resistance, MIL-D-3134 or MIL-D-24613	Fire Retardant

Slip resistance properties, MIL-D-3134
or MIL-D-24613
Abrasion Resistance, CS17 Wheel
1000 gram load, 1000 cycles

Static Friction .6
.060 gram loss

2.3 ACCESSORIES

- A. Primer: Type recommended by manufacturer for substrate and body coats indicated.
- B. Waterproofing Membrane: Type recommended by manufacturer for substrate and primer and body coats indicated.
- C. Reinforcing Membrane: Flexible resin formulation that is recommended by manufacturer for substrate and primer and body coats indicated and that prevents substrate cracks from reflecting through resinous flooring.
 - 1. Provide fiberglass scrim embedded in reinforcing membrane.
- D. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- E. Control-joint filler: Fast-setting two-component polyurea product or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
 - 1. TF-100 as manufactured by BASF
- F. Sealant:
 - 1. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 - a. SONOPALSTIC® SL12 as manufactured by BASF and as approved by resinous flooring manufacturer.
 - 2. Installed under this specification and in accordance with flooring manufacturer and sealant manufacturer.
 - a. Refer to Section 07 9200 "Joint Sealants"

2.4 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Finishing and Edge Protection for floor transitions:
 - 1. Manufacturer: Basis of Design: The design is based on Schluter System (800-574-8481).
 - 2. Profile: Reno TK, Satin anodized aluminum, profile item AETK 80. Include matching inside/outside corner and connectors.
 - a. Height: Match tile height.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Concrete must have a curing period of 28 days minimum at 70° F. The surface must be clean and dry, physically sound and free of contamination. Surfaces must be free of holes, voids or defects. Cracks and abrupt changes in surface profile must be corrected. Fins and projections must be removed. All curing compounds and sealers must be removed.
- B. Verify that moisture content is within range acceptable to flooring manufacturer, using a calcium chloride test kit in accordance with test method ASTM F 1869.
- C. Contractor must report, in writing, surfaces left in improper condition by other trades.
 - 1. Application will constitute acceptance of surfaces by the applicator.

3.2 PREWORK INSPECTION

- A. Examine all surfaces to be coated with resinous material systems and report to the Owner and Architect any conditions that will adversely affect the appearance or performance of these coating systems and that cannot be put into acceptable condition by the preparatory work specified.
- B. Do not proceed with application until the surface is acceptable.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Test in accordance with Section 09 0512.
 - 2. If test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511, and install Water Vapor Emission Control Coating as specified in Section 07 2633.

3.3 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
 - 1. Surface Preparation – General
 - a. Concrete substrate must be clean and dry. Dislodge dirt, mortar spatter, paint overspray, and other dry surface accumulations and contamination by scraping, brushing, sweeping, vacuuming, and/or compressed air blow-down.
 - b. New concrete: As specified
 - c. Surfaces that are heavily contaminated shall be cleaned with the appropriate degreaser, detergent, or other appropriate cleaner/surfactant followed by thoroughly rinsing with fresh water to remove the accumulation prior to mechanical cleaning efforts.

- 1) Mechanical cleaning without degreasing can drive these deposits further into the substrate.
 - d. Concrete shall have a moisture emission rate of no more than 4 lbs. per 1000 sq. ft. per 24 hour period as determined by proper Calcium Chloride Testing.
 - 1) Refer to and coordinate with Section 07 2633 "Water Vapor Emission Control Coating"
 2. Mechanical Surface Preparation and Cleaning
 - a. The Selbatwede 41 system requires a CSP 3-5 in accordance with ICRI CSP Surface Preparation Standards. All accessible concrete floor surfaces shall be mechanically blast cleaned using a mobile steelshot, dust recycling machine such as BLASTRAC, as manufactured by Wheelabrator Corp., or approved equivalent. All surface and embedded accumulations of paint, toppings, hardened concrete layers, laitance, power trowel finishes, and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a profile similar to 40 grit sandpaper and exposing the upper fascia of concrete aggregate.
 - b. Floor areas inaccessible to the mobile blast cleaning machines shall be mechanically abraded to the same degree of cleanliness, soundness, and profile using vertical disc scarifiers, starwheel scarifiers, needle guns, scabblers, or other suitably effective equipment.
 - c. After blasting, traces or accumulations of spent abrasive, laitance, removed toppings, and other debris shall be removed with brush or vacuum.
 - d. Application of the respective specified material system(s) must be completed before any water or other contamination of the surface occurs.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Perform relative humidity test using in situ probes, ASTM F 2170 as specified in related section 09 0512. Proceed with installation only after substrates have a maximum relative humidity level measurement not exceeding the flooring manufacturer's recommendations.
 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 5. Concrete must have a curing period of 28 days minimum at 70° F. The surface must be clean and dry, physically sound and free of contamination. Surfaces must be free of holes, voids or defects. Cracks and abrupt changes in surface profile must be corrected. Fins and projections must be removed. All curing compounds and sealers must be removed.

- 6. Verify that moisture content is within range acceptable to flooring manufacturer, using a calcium chloride test kit in accordance with test method ASTM F 1869.
- 7. Contractor must report, in writing, surfaces left in improper condition by other trades.
 - a. Application will constitute acceptance of surfaces by the applicator.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.4 APPLICATION / INSTALLATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply waterproofing membrane, at locations where required by moisture conditions in concrete substrate, in manufacturer's recommended thickness.
 - 1. Apply waterproofing membrane to integral cove base substrates.
- D. Apply reinforcing membrane to entire substrate surface.
- E. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 - 1. Integral Cove Base: 4 -inches (100 mm) high.
- F. Apply troweled body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.
- G. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.
- H. Sealant:
 - 1. Install in accordance with flooring manufacturers recommendations and sealant manufacturer's.

3.5 FIELD QUALITY CONTROL

- A. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.
- B. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.
 - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

3.7 SCHEDULE

- A. Industrial Decorative Resinous Floor:
 - 1. Surface Preparation:
 - a. SSPC-SP13 / NACE No. 6 Surface Preparation of Concrete, minimum concrete surface profile (CSP) 5 per ICRI Technical Guideline 03741.
 - 2. Prime:
 - a. If Moisture Vapor Transmission (MVT) is outside manufacturer's recommended range, prime horizontal surfaces with flooring manufacturers approved material in thickness as recommended.
 - 3. Mortar / Slurry Base Coats:
 - a. Product as specified in multiple coats and thickness as specified.
 - 4. Broadcast Aggregate:
 - a. Product as specified in multiple applications and coverage as as specified.
 - 5. Initial Clear coat:
 - a. Product as specified in thickness as specified.
 - 6. Final Finish Coat:
 - a. Same product as Initial clear coat in thickness as specified.

- END OF SECTION -

- SECTION 09 6800 -**CARPETING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Preparation of Surfaces to Receive Carpeting.
 - 2. Carpet:
 - a. Furnished by Owner, installed by Contractor
 - b. Stretch-in Installation
 - c. Direct-Glue-Down Installation
 - d. Double-Glue-Down Installation
 - e. Carpet with Attached-Cushion Installation
 - f. Carpet with Pre-applied Adhesive Installation
 - 3. Carpet Cushion: (Pad)
 - a. Installation by contractor under this specification.
 - 1) Carper Pad shall be Furnished by Owner.
 - 4. Carpet Base.
 - 5. Accessories, including tack strips, adhesives tapes and all other required accessories.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 03 3000 "Cast-in-Place Concrete" for Concrete slab substrate.
- D. Section 03 3500 "Concrete Finishing"
- E. Section 07 2633 "Water Vapor Emission Control Coating (Flooring)".
- F. Section 07 9200 "Joint Sealants".

- G. Section 09 0511 "Concrete Floor Preparation".
- H. Section 09 0512 "Concrete Floor Moisture Content & pH Testing".
- I. Section 09 3013 "Tiling".
- J. Section 09 6423 "Wood Parquet Flooring (C)".
- K. Section 09 6500 "Resilient Floor" for transitions accessories not herein specified.
- L. Section 09 6566 "Resilient Athletic Flooring".
- M. Section 09 6723 "Resinous Flooring".
- N. Division 14 for Elevators.
- O. Seam Layout Drawings provided by Marriott International.
- P. Marriott International FF & E Specification Manual.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; Federal Register, July 26, 1991; updated 2010.
- C. [ASTM International \(ASTM\)](#) Publications: (Former American Society for Testing and Materials):
 - 1. D5116 "Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products"
 - 2. F710 "Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring"
 - 3. F1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride"
- D. [Federal Specifications \(FS\)](#)
 - 1. FS DDD-C-0095 Carpet and rugs, wool, nylon, acrylic, modacrylic, polyester, polypropylene
- E. [Carpet & Rug Institute \(CRI\)](#) Publications:
 - 1. CRI 104 Carpet Installation Standard
- F. [Occupational Safety & Health Administration \(OSHA\)](#) Regulations:
 - 1. [OSHA](#) Regulation 29 [CFR](#) Toxic and Hazardous Substances 1910-1200 Hazard Communication
- G. [U.S. Department of Commerce \(DOC\)](#) Publications:
 - 1. Federal Flammability Standard [DOC](#) FF 1-70 (Methenamine Pill test [ASTM](#) D2859).

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- E. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
 - 1. A copy of the manufacturer's printed installation manual shall accompany Bid for review and approval by the Owner's Representative.
 - 2. Shop Drawings showing layout and seaming diagrams. Indicate pile or pattern direction and locations and types of edge strips. Indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - a. Show installation details at special conditions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with not less than 5 years of experience in installation of commercial carpeting of type, quantity, and installation methods similar to work of this Section, or can demonstrate compliance with its certification program requirements.
- B. Successful vendor shall be responsible for field measurements to determine carpet layout.
- C. Carpet Surface Burning Characteristics: Provide carpet identical to that tested for the following fire performance characteristics, per test method indicated below, by [UL](#), [ASTM](#) E648, or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify carpet with appropriate markings of applicable testing and inspecting organization.
 - 1. Test Method: [DOC](#) FF 1-70
 - 2. Rating: Pass
- D. The carpet contractor is responsible for reviewing carpet manufacturer's published installation instructions prior to installation. This includes understanding dye lots, pattern sequencing, pattern matching and any special instructions. Failure to abide by the manufacturer's instructions could result in a backcharge to contractor for corrections to the installation.
- E. Contractor is responsible for damages to work performed by others including but not limited to telephone or television wires placed in front of the tack-strip running the perimeter of the room.
- F. The installation contractor is responsible for verification of quantities within fourteen (14) days on new construction. The contractor shall provide take-offs of all carpet and padding, as required for a complete installation. No compensation will be allowed to the installation

contractor for materials and labor that may be required to install additional carpeting because of incorrect quantity takeoffs.

1. Confirm time frame with Division 1 Specifications.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. General: Comply with the Carpet and Rug Institute's [CRI](#) 104, Section 05: "Storage and Handling".
- C. Do not deliver carpet until areas of building are ready for carpet installation. Provide protection from loss or damage.
- D. Store materials in original undamaged packages and containers, inside well-ventilated, dry area protected from weather, moisture, soilage, extreme temperatures and humidity. Lay flat, blocked off ground. Maintain minimum temperature of 68 degrees F. (20 degrees C.) at least three days prior to and during installation in area where materials are stored. Never stack carpet more than two rolls high or stand up on roll ends on job site. Do not bend or fold carpet in storing.
- E. Carpet shall never be stacked more than five (5) rolls high.

1.8 PROJECT CONDITIONS

- A. General: Comply with [CRI](#) 104, Section 07: "Site Conditions".
- B. Do not commence with carpet installation until painting and finishing work is complete and ceilings and overhead work has been tested, approved, and completed.
- C. In areas to receive carpet, room temperatures shall be maintained at 65-90 degrees F and with relative humidity ranging between 20 percent and 65 percent minimum for 72 hours prior to, during, and 72 hours following application. Materials shall be conditioned at application temperature and humidity at least 24 hours prior to application. Provide sufficient lighting for carpet installation.
- D. Contractor shall provide method approved by the Architect to mechanically exhaust all spaces to receive carpet to the exterior during installation and a minimum of 72 continuous hours, or length of time required by the manufacturer or Owner after installation.
- E. Subfloor Moisture Conditions: Before installing carpet Contractor shall verify that Moisture emission rate of not more than 3 lb/1000 sq. ft./24 hours when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 deg F, or as recommended by manufacturer.
- F. Subfloor Alkalinity Conditions: Before installing carpet Contractor shall verify that a pH range of 5 to 9 when subfloor is wetted with potable water and pHHydron paper is applied.

1.9 WARRANTY

- A. Stretch-in installation labor shall be guaranteed for one (1) year. Sixty days after installation, the Subcontractor is to re-stretch all carpet where necessary and as directed by Marriott Representative.
- B. Tred-Mor Dubl-Stik installation labor shall be guaranteed for five (5) years.
- C. The adhesive manufacturers offer five (5) year warranty on their adhesives used on a Tred-Mor Dubl-Stik installation.
- D. It is the carpet Contractors responsibility to fill out the adhesive manufacturer warranties. The warranty must be returned to the adhesive manufacturer and a copy sent to the Contractor's representative.

1.10 EXTRA MATERIALS

- A. Refer to Section 01 7843 "Spare Parts" for requirements.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Pile Height: 1/2 -inch maximum.
- C. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.

2.2 MATERIALS

- A. Carpet: Refer to Interior Finish Specifications Drawings
- B. Pad: Refer also to Interior Finish Specifications Drawings

2.3 CARPET CUSHIONS (PAD)

- A. The following carpet cushion information is provided solely for use by the Contractor to determine locations.
 - 1. Refer also to Interior Finish Specifications Drawings.
 - 2. Owner furnished and contractor installed.

B. Rubber padding:

1. Designation: **CP-1**

- a. Model: ONYX BV0092
- b. Weight: 56 oz.
- c. Application: Pad shall be installed in Guest Rooms and suites unless TredMor pad is specified.
- d. Type: Flat Rubber Textured / Badger waffle type pad
- e. Color: Black
- f. Density: 20lbs.
- g. Thickness: 1/4 -inch (.250 -inches)
- h. Size: 54 -inches wide by 60 -inches long
- i. Anti-Microbial: Yes, GUARDIAN®
- j. Warranty: Commercial: Life of Carpet
- k. Pill Test (DOC-FF, 1-70): Pass

C. Cushion Padding - SCI Sponge Cushion, Inc.

1. Designation: **CP-2**

- a. Product: Tred-Mor 2568 QL
- b. Application:
 - 1) Used in Guest Room Corridors and other Public Areas not listed or specified
 - 2) Refer to Interior Drawings.
- c. Material: 100 percent Styrene Butadiene
- d. Type: Sponge cushion
- e. Weight: 68 oz.
- f. Color: Black
- g. Density: 22 lbs.
- h. Thickness: .250 -inch
- i. Width: 4 -feet -6 inches
- j. Backing: Spun bonded fiberglass netting
- k. Anti-Microbial: Yes, GUARDIAN®
- l. Warranty: Commercial: Limited Life of Carpet
- m. Pill Test (DOC-FF, 1-70): Pass

2.4 ACCESSORIES

- A. Seaming: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.
- B. Hot melt tape – (all stretch installation areas except Dubl-Stik installations)
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None
 - 2. Approved Manufacturers:
 - a. “6 -inch - Super 3S Tape”; ORCON (800-227-0601)

- C. Carpet and Accessory Adhesives: (All direct glue-down areas except double-stik installations)
1. Non-staining type as recommended by carpet manufacturer for use intended, complying with the following:
 - a. Adhesive: As recommended by carpet manufacturer for use intended, complying with the following: Adhesive shall be antimicrobial with no hazardous vapors and contain no carcinogenic materials, per [OSHA](#) Regulation 29 CFR 1910-1200. All containers shall contain material safety data sheets (MSDS) and be available at job site for inspection.
- D. Carpet Adhesive - Dubl-Stik Installation
1. Avendra, LLC Preferred Manufacturers:
 - a. None.
 2. Approved Manufacturers:
 - a. "SS-5" ("Safe-Set"); CHAPCO (Chicago Adhesive Products, Co.) (800-621-0220)
 - b. "Parabond" Dubl-Stik DS-902; Para-Chem, Inc. (800-763-7272).
 - c. "ECO-220", Mapei Corp. (800-426-2734).
- E. Carpet Seam Adhesive - Dubl-Stik Installation
1. This product shall be used to join the primary backs of tufted carpet and the woven backs of Axminster carpet together.
 - a. All seam adhesives shall be latex type.
 2. Avendra, LLC Preferred Manufacturers:
 - a. None.
 3. Approved Manufacturers:
 - a. "Seam Cement #112"; CHAPCO (Chicago Adhesive Products, Co.) (800-621-0220)
 - b. "Parabond Premium Latex Seam Sealer M267"; Para-Chem, Inc. (800-763-7272).
 - c. "Ultrabond ECO 2085", Mapei Corp. (800-426-2734).
 - d. Substitution as approved by Marriott International.
- F. Hot Melt Tape - Dubl-Stik Installation
1. Avendra, LLC Preferred Manufacturers:
 - a. None
 2. Approved Manufacturers:
 - a. "CT-7DS"; ORCON (800-227-0601)
 3. NOTE: MANDATORY USE WITH BRINTONS AND COURISTAN CARPETS
 4. The use of hot melt tape is optional and depends on the carpet installer's preference. There are instances during some installations, such as pattern matching, where the hot melt tape may simplify and speed up installation.
 5. CAUTION: DO NOT USE A SILICONE TREATED TAPE. THE SILICON WILL PREVENT THE ADHESIVE FROM ADHERING TO THE BACK SIDE OF THE TAPE.
- G. Tack Strips:
1. Water-resistant plywood strips as required to match pad thickness and in compliance with [CRI](#) 104, Section 11.3.
 2. Commercial with 3 rows of pins.
 - a. Type 1: Pre-nailed (Concrete) for anchoring into concrete sub-floor.

- b. Type 2: Extra long nails for cementitious leveling bed over plywood sub-floor.
- H. Concrete Leveling and Patching compounds:
- 1. For areas up to 4 square -feet:
 - a. Feather finish, use to smooth ridges, fill cracks, gouges and joints.
 - 1) "SD-F"; Ardex (724-203-5000).
 - 2) "Planiprep FF", Mapei Corp. (800-426-2734).
 - b. Trowelable underlayment patch for thickness from feather edge to 3 inch without aggregate.
 - 1) "Quickpatch", Mapei Corp. (800-426-2734).
 - c. Trowelable underlayment patch for thickness up to 1/2 -inch without aggregate; up to 1 -inch with aggregate. Can be feather edged.
 - d. "SD-P/ Primer P-82"; Ardex (724-203-5000)
 - 2. For areas exceeding 4 square -feet:
 - a. Self-leveling, pourable or pumpable underlayment for thicknesses up to 5 -inches. Can be feather edged.
 - 1) "K-15/Primer P-51"; Ardex (724-203-5000).
 - 2) "Novaplan 2/Primer", Mapei Corp. (800-426-2734).
 - a) Refer to product datasheet for specific requirements based on substrates.

2.5 TRANSITION EDGES

- A. Carpet Transition Edges:
 - 1. Refer to Interior Finish Specifications Drawings and Section 09 6500.
- B. Carpet to Carpet Transition components:
 - 1. Refer to Section 09 6500
- C. Carpet to Tile Transition components: (Overlapping)
 - 1. Refer to Section 09 6500
- D. Carpet to Tile Transition components: (Flush Transition)
 - 1. Refer to Section 09 3013
- E. Carpet to Wood Transition components:
 - 1. Mfgr: Schluter Systems
 - 2. Model: SCHIENE
 - 3. Drawing designation: ("TS-2")

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- B. Cementitious Subfloor Surfaces: General Contractor shall verify that concrete slabs comply with [ASTM](#) F710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the carpet and carpet cushion manufacturers, including [ASTM](#) F1869. It is essential that moisture tests be taken on all concrete floors regardless of age and grade level. The test should be in accordance with [ASTM](#) F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride. One test should be conducted for every 1000 sq. ft. of flooring and the results not exceed 3 lbs. Per 1000 sq. ft. in 24 hours. If the test results exceed the limitations, the installation must not proceed until the problem has been corrected.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b. Refer to Section 07 2633 "Water Vapor Emission Control Coating"
 - 2. Subfloor Alkalinity Conditions: Before installing carpet Contractor shall verify that a pH range of 5 to 9 when subfloor is wetted with potable water and pHydron paper is applied.
 - a. Refer to Section 09 0512 "Concrete Floor Moisture Content and pH Testing"
 - b. Refer to Section 07 2633 "Water Vapor Emission Control Coating"
 - 3. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet.
 - 4. Subfloors are free of cracks, ridges, depressions, scale and foreign deposits. Sand smooth or fill voids to obtain a smooth level substrate, any noticeable deviation in flooring may be rejected.
 - 5. Ensure floors are level with maximum surface variation of 1/4 -inch in 10 -feet.
 - a. Refer also to Section 03 3500 "Concrete Finishing" for more restrictive requirements.
- C. Report conditions contrary to Contract requirements which would prevent a satisfactory installation. Proceed with installation only after unsatisfactory conditions have been corrected, as approved by General Contractor.
 - 1. Failure to call attention to any defects or imperfections will be construed as acceptance and approval of the subfloor.
 - 2. Installation indicates acceptance of substrate conditions at the time of installation.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of products.

- B. Concrete Substrates for materials installed under this specification: Test and prepare concrete substrate.
1. Testing:
 - a. If test results from Section 09 0512 are within limits recommended by flooring manufacturer and adhesive materials manufacturer, prepare floor substrates for installation of flooring in accordance with Section 09 0511 and as recommended by flooring and adhesive manufacturers.
 - b. If test results from Section 09 0512 are not within limits recommended by flooring manufacturer and adhesive materials manufacturer, verify installation of Water Vapor Emission Control Coating as specified in Section 07 2633 is complete.
 2. Preparation:
 - a. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
 - 1) Repair damage to Water Vapor Emission Control Coating where occurs and re-test for adhesion as specified in Section 07 2633.
 - b. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - c. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer.
 - 1) Do not use solvents.

3.3 SITE ENVIRONMENTAL PROCEDURES

- A. Indoor Air Quality:
1. Temporary ventilation:
 - a. Ventilate products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degrees F maximum for minimum 72 hours. Do not ventilate within limits of Work unless otherwise approved by Architect.
 2. Immediately after installation, clean carpet thoroughly with a high-efficiency particulate air (HEPA) filtration vacuum.

3.4 PREPARATION

- A. General: Comply with [CRI](#) 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written instructions for preparing substrates indicated to receive carpet installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
1. Level subfloor within 1/4 -inch in 10 -feet noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
 2. Refer also to Section 03 3500 "Concrete Finishing"

- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the following:

1. Carpet manufacturer
2. Carpet cushion manufacturer

3.5 INSTALLATION

- A. Direct-Glue-Down Installation: Comply with [CRI](#) 104, Section 8, "Direct Glue-Down Installation"
1. In the case of direct glue-down, carpet glued to floor, no padding required, follow the manufacturers specifications.
 2. Milliken modular carpets and Collins & Aikman uniback carpet requires the use of their own adhesives when installing their products.
- B. Double-Glue-Down Installation: Comply with [CRI](#) 104, Section 9, "Double Glue-Down Installation"
- C. Carpet with Attached-Cushion Installation: Comply with [CRI](#) 104, Section 10, "Attached Cushion"
- D. Carpet with Preapplied Adhesive Installation: Comply with [CRI](#) 104, Section 10.4, "Pre-Applied Adhesive Systems"
- E. Stretch-In Installation: Comply with [CRI](#) 104, Section 11, "Stretch-In Installation"
1. Install tack strip with adhesive, drill and pin, or nailing, or combination, where required for adequate strength.
 2. Locate Tack strip 1/4 inch from wall to conceal carpet edge between stripping and base of wall. Strip entire perimeter of each carpeted space and at obstructions and cutouts.
 3. Tap down tackstrip pins in Guestrooms at Entrances, Bathroom, Closets, and Balconies.
 4. Tred-Mor Pad Installation
 - a. Refer to Scope of Work, and the Interior Design Drawings, for Tred-Mor pad locations. Tred-Mor padding will be installed using the stretch-in installation method listed above unless Tred-Mor Dubl-Stik is specified.
 5. Power stretch carpet uniformly in both directions the exact amount recommended by carpet manufacturer; trim edges, secure to stripping and conceal behind edge of stripping.
 - a. Stretch-in installations must be power stretched uniformly length and width **1 percent to 1.5 percent** using a power stretcher.
 - b. When Graphic Action Back Carpet is specified, a uniform length and width power stretch of **.75 percent to 1 percent** is acceptable.
 6. Use a carpet covered minimum **48 -inch** long **4 x 4** buffer block between power stretcher and wall to prevent damage to wall. Use a wall trimmer to trim carpet along walls and abutments. This Contractor shall be responsible for wall damage caused by installation Work.
 - a. Trimmer must be adjusted to leave sufficient excess carpet to tuck into gullies.
- F. Stair Installation: Comply with [CRI](#) 104, Section 12, "Carpet on Stairs"

- G. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. Level adjoining border edges
- H. Do not bridge building expansion joints with carpet.
- I. Cut and fit carpets to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
 - 1. Check matching of carpet before cutting and ensure there is no visible variation between cut pieces.
 - 2. Cut carpet, where required, in a manner to allow proper seam and pattern match. Ensure cuts are straight and true and unfrayed.
- J. Carpet shall extend to the back of all toe spaces, under all millwork, cabinetwork, convectors, bookshelving, and similar items to the limiting planes of the floor surface. Where carpet terminates at a doorway, termination of carpet shall occur under the edge of the closed door, or at the side of the threshold where this is required. Cut and fit carpeting to all obstructions protruding from the floor surface, such as columns, pipes, thresholds, electrical, and telephone outlets, etc. All raw edges shall be sealed and securely and neatly tucked into place.
- K. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- L. Install pattern parallel to walls and borders.
- M. Carpet shall be installed by experienced carpet layers in an approved manner, using Marriott's recommended adhesive and procedures, as approved by carpet manufacturer. Install carpet with pile running in the same direction, unless specifically directed to do otherwise.
- N. Install carpet cushion seams at 90-degree F angle with carpet seams.
- O. The final carpet pattern, layout, edge binding locations shall be as directed and approved by Owner's Representative. All associated installation shall be by this Contractor.

3.6 INSTALLATION - TRED-MOR DUBL-STIK

- A. Glue-Down Cushion - Pressure Sensitive Adhesive:
 - 1. After all floor preparation is completed, the layout of the cushion should be planned. Cushion should be installed in longest lengths possible with consideration for traffic patterns and seam placement. Cushions seams should not be directly under carpet seams and generally should be at right angles to them. When this is not possible, shift cushion or carpet so that cushion seams are at least 6 -inch to one side of carpet seams. After completing the cutting and fitting, begin gluing. Fold back the cushion and begin applying the adhesive to the floor. Refer to adhesive manufacturer's instructions for trowel size. Coat the floor with a continuous thin film of adhesive. A thick film will not be permitted. The optimum time to install cushion onto the adhesive is after the adhesive has become tacky dry. Do not lay the cushion into wet pressure sensitive adhesive.
 - 2. Gluing Cushion to Floor:

- a. Pressure Sensitive Adhesive: For most installations, a 1/32 -inch x 1/32 -inch x 1/32-inch trowel size will be sufficient. However, if floor is very porous (rough concrete, particle board, plywood, etc.), a larger trowel notch may be required. Some pressure sensitive adhesives can be applied more quickly to smooth subfloors by using a short nap paint roller. Comply with the adhesive manufacturer's instructions covering the specific adhesive. After adhesive application has been completed, place the cushion onto the adhesive and adjust where necessary to ensure there are no gaps at seams and whether full contact is made with adhesive. Smooth out air bubbles with a 2 -foot piece of carpet core or the bottom of a tool box shelf.
3. Glue Down Carpet to Cushion:
 - a. Multipurpose - Carpet Adhesive - Premium Quality: For use between the cushion and tufted carpets with a secondary back or woven carpets, only a quality Brand Premium Adhesive should be used. Conform to manufactures recommendations and spread with a properly selected notched trowel. Maintain proper notch size throughout the installation.
 - b. Laying Out Carpet and Installing: Follow industry accepted methods for a glue-down installation. All carpet should be spread in the room 24 hours prior to actual installation with room temperature between 65 degrees and 95 degrees F. Open carpet and spread it out over cushion. Roughly locate the carpet three to four inches longer than the area measurement. Align all breadths in their proper positions and trim the seams. All seam edges must be trimmed using the appropriate seam cutting tools, according to the carpet manufacturer's recommendations, before spreading the adhesives. Do not double cut carpet seams where cutting tool will penetrate the cushion; this can weaken the finished seam. Select the appropriate adhesive and trowel notching, as recommended for the coarseness of the carpet backing. On tufted carpets with a secondary back and on woven carpets, the trowel notch shall be large enough for the adhesive to make good contact with the recessed areas of the backing. Very coarse textured backings, rough porous concrete surfaces, or other unusual conditions, can require a trowel with deeper notches as recommended by the adhesive manufacturer. Lack of adhesion caused either by a lower quality adhesive or wrong trowel selection is the number one cause of installation failure.
 - c. The adhesive is to be spread uniformly over the cushion with selected trowel. After sufficient open time, the carpet should be pressed down into the adhesive using a 2-foot section of carpet tube or a stiff broom (not nylon), or a roller weighing no more than 35 pounds.
 - d. The following types of carpet can be glued down to cushion: woven wilton, woven axminster, tufted with secondary backing of jute or synthetic, tufted carpet with no secondary backing (unitary backing), tufted carpet with thermo-plastic (hot melt) application of secondary backing of jute or polypropylene, or cushion-bonded.
 - e. Floor preparation and testing, as well as cutting, fitting and laying of cushion and carpet are essentially the same for all types. However, the type of adhesive and the depth of the notches in the trowel (which controls the amount of adhesive being applied) depends on whether you are installing cushion or the carpet and on what type floor and carpet backing. Refer to carpet manufacturer or adhesive manufacturer's instructions for recommendations.

3.7 SEALING CUT EDGES

- A. To prevent fraying and raveling at all seams and transition areas, a continuous bead of seam adhesive must be applied to the first edge where the face yarn enters the backing.

- B. On woven carpet, all cut edges at seams and transition areas must be secured with a latex seam adhesive immediately following the seam trimming.

3.8 SEAMING

- A. Install pad and carpet seams in accordance with manufacturer's published instructions.
- B. Locate pad seams at right angles to carpet seams. Where not possible to locate at right angles, locate pad seam minimum 6 inches away from carpet seams. Butt pad edges tightly together to form seams without gaps. Tape pad seams.
- C. Maintain uniformity of carpet direction and lay of pile. At doors, center seams under doors; do not place seams in traffic direction at doorways.
- D. Orcon Super 3S Wide tape will be used on all public area seams specifying hot melt tape.
- E. The seaming iron with heat shield must be of proper size, matching the hot melt tape being used.
- F. The proper head setting and exposure time must be used to assure proper transfer without creating damage to backing or pile yarn.
- G. Orcon Super 3S tape will be used in Guest Rooms and suites where seams are specified.
- H. Cutting and Seaming Plan:
 - 1. Guest Room and Suites: Refer to the Interior Design Drawings seaming layouts.
 - a. If the Marriott Regional Warehouse is used, the carpet will arrive pre-cut and labeled.
 - b. Public Areas: Refer to the Interior Design Drawings seaming layouts and the carpet suppliers seaming layouts.
 - c. If the Marriott Regional Warehouse is used, the Public Area carpet will arrive in full uncut rolls.
- I. Where conflicts between Owner's requirements and manufacturer's requirements occur, use Owner's requirements.

3.9 ACCESSORIES

- A. Provide carpet edge guard where edge of carpet is exposed; anchor guards to substrate. Edge guard shall be used in all doorways or openings where no sill is installed or as required.
- B. Stair Nosing: Coordinate with installation of carpet so that edge of the carpet is installed under edge of nosing or otherwise protected from unraveling.
 - 1. Base (in corridors): Carpet Base, to match adjacent floor.
 - 2. Install carpet base prior to installing carpet, aligned straight and level. Neatly fit against floor carpet.
 - 3. Fix the carpet base to walls using a manufacturer approved adhesive. Mechanically attach the base to the wall at the bottom edge of surging when required. Staples shall not be permitted.

3.10 ADJUSTING

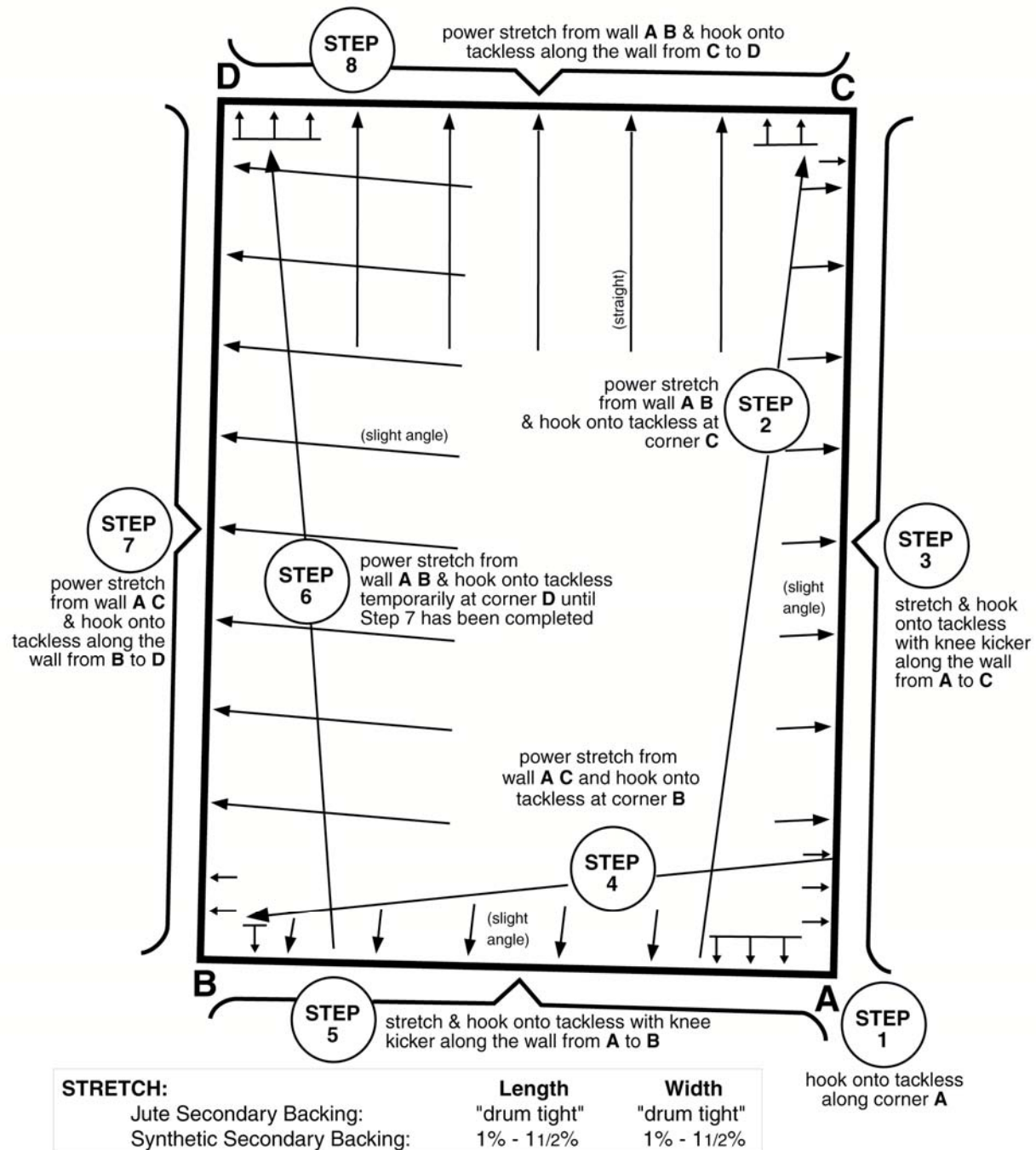
- A. Stretch-In Installation: Restretch carpet sixty days after Substantial Completion, as directed by Owner.

3.11 CLEANING AND PROTECTION

- A. Comply with [CRI](#) 104, Section 15, "Protection of Indoor Installation".
- B. Remove and dispose of debris and unusable scraps daily.
- C. Vacuum carpet daily using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed. Remove any protruding face yarn using sharp scissors. Knock down tacks at entries to baths and guest rooms (to protect feet).
- D. Maintenance Materials: Deliver specified overrun (if any) and usable scraps of carpet to Owner's designated storage space, properly packaged (paper wrapped) and identified. Usable scraps are defined to include roll ends of less than 9'-0" length, and 3'-0" wide. Dispose of smaller pieces as "construction waste".
- E. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

TUFTED

Amount of Stretch as per the Carpet Manufacturer's Recommendation
In Absence of Carpet Manufacturer's Recommendation, Use Diagram Below



Note: To be used for all brands
Note: To be used for courtyard and residence inn.

- END OF SECTION -

- SECTION 09 7200 - WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Installation of Vinyl Wall Covering
 - a. Furnished by Owner, installed by Contractor
 - 2. Prime Coat on Walls
 - 3. Adhesives and Cleaning of Adjacent Surfaces
 - 4. All accessories for complete installation

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 09 2900 "Gypsum Board".
- D. Section 09 9123 "Interior Painting".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [ASTM International \(ASTM\)](#) Publications:
 - 1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
 - 2. F793 "Standard Classification of Wall-covering by Durability Characteristics"
- C. [Gypsum Association \(GA\)](#) Publications:
 - 1. Recommended Levels of Gypsum Board Finish - [GA-214-M-97](#)
- D. [National Fire Protection Association \(NFPA\)](#) Publications:

1. [NFPA](#) 265: Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.
 1. Provide certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).
 2. Provide maintenance data including methods for maintaining wallcovering as well as precautions for use of cleaning materials and methods that could be detrimental to finishes and performance.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed five projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Single Source Responsibility: Provide adhesives and primers produced by the same manufacturer.
- C. Coordination of Work: Review Sections in which primers are provided to ensure compatibility of the total systems for various substrates.
 1. Notify the Owner's Representative of problems anticipated using the materials specified.
- D. Mockups: Provide a sample application in one Guest Room for acceptance by the Owner's representative and to serve as a sample standard of quality for the balance of the work. Rework sample room if necessary to obtain Owner's acceptance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Store wall-covering in clean and dry area where temperatures are maintained at minimum 40 degrees F. with normal humidity. Do not store in upright position.
- C. Take precautionary measures to prevent fire hazards with adhesives and solvents.
- D. Where toxic materials and both toxic and explosive solvents and adhesives are used, appropriate precautions and proper ventilation must be provided.
- E. Handle and store materials at the project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classifications.
- F. Contractor is responsible for theft or damage to stored materials. Exercise care to prevent damage during delivery, handling and storage.

WALL COVERINGS

1.8 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wall covering until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.
 - 1. Maintain surfaces and materials at constant minimum temperature of **60 degrees F** and max temperature of **90 degrees F** in areas of installation for at least 72 hours before and 48 hours after the application of materials.
 - 2. Install only when humidity conditions approximate building design humidity.
- B. Lighting: Do not install wall covering until a lighting level of not less than **15 foot-candles** (160 lux) is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the wall covering manufacturer for full drying or curing.
- D. Remove wall covering from its packaging and allow to acclimatize to the area of installation 24 hours.
- E. Ensure maximum surface moisture conforms to wallcovering manufacturer's requirements and surface exhibits negative alkalinity.

1.9 EXTRA MATERIALS

- A. Refer to Section 01 78 43 "Spare Parts" for requirements.

PART 2 - MATERIALS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 SYSTEM DESCRIPTION

- A. Contractor is responsible for receiving and handling on site and installing wall covering material furnished by Owner and will fill out and process all receiving reports furnished by Owner.
- B. Provide strippable adhesive and primer for all wall covering.
- C. Contractor shall provide wall covering quantity take-offs to the Owner within 45 days of award of the contract.

2.3 MATERIALS (VWC-*)

- A. Wallcovering: Refer to Interior "Finish Specifications" Drawings.

2.4 FIRE HAZARD CLASSIFICATION

- A. Provide materials bearing the [UL](#) label and marking, indicating the fire hazard classification of the wall covering as determined by [ASTM](#) E84.

2.5 WALL COVERING PRIMER/ADHESIVE

- A. Approved Manufacturers:
1. Avendra, LLC Preferred Manufacturers:
 - a. None.
 2. Approved Manufacturers:
 - a. U.S. Vinyl Manufacturing Corporation (800-633-6425).
 - b. Roman Decorating Products (800-488-6117).
 - c. Gardner-Gibson, Inc. (813-248-2101).
- B. Manufacturer's recommended Mildew-resistant, nonstaining[, strippable adhesive, primer, and sealer manufactured expressly for use with the selected wallcovering. Provide materials that contain mildew inhibitors that are nonstaining to the wall-covering.

C.	New wallcovering over new gypsum board (except at Guestbaths):		
	<u>MANUFACTURER</u>	<u>PRIMER</u>	<u>ADHESIVE</u>
	1. Roman Decorating Products	"UltraPrime 909"	"Ultra Pro 880" or "Clear Strippable Pro 870" for use with pasting machine
	2. Gardner-Gibson	Not needed	Dynamite 234 Premium Clear/Strippable or Dynamite 780 Flowable Clear/Strippable
	3. U.S. Vinyl	Not needed	H. D. Clear Strippable 3000
D.	New wallcovering over new gypsum board (at Guestbaths):		
	<u>MANUFACTURER</u>	<u>PRIMER</u>	<u>ADHESIVE</u>
	1. Roman Decorating Products	Pro-977	"Ultra Pro 880" or "Clear Strippable Pro 870" for use with pasting machine
	2. Gardner-Gibson	Dynamite 222.1 Acrylic Primer	Dynamite 234 Premium Clear/Strippable or Dynamite 780 Flowable Clear/Strippable
	3. U.S. Vinyl	Not needed	H. D. Clear Strippable 3000

2.6 ACCESSORIES

- A. Masking Tape:
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None.
 - 2. Approved Manufacturers:
 - a. "General Purpose Type"; 3M Adhesives, Coatings and Sealers Div. (612-733-1140).

2.7 GRAPHIC WALL COVERING PRIMER/ADHESIVE

- A. Manufacturer's recommended adhesive, primer, and sealer manufactured expressly for use with the selected Graphic wallcovering. Provide materials that contain mildew inhibitors that are nonstaining to the wall-covering.
 - 1. Avendra, LLC Preferred Manufacturers:
 - a. None.
 - 2. Approved Manufacturers:
 - a. U.S. Vinyl Manufacturing Corporation (800-633-6425).
 - b. Roman Decorating Products (800-488-6117).
 - c. Primer: "UltraPrime 977".
 - d. Adhesive: "Ultra Pro 880" or "Clear Strippable Pro 870" for use with pasting machine.

PART 3 - EXECUTION**3.1 INSPECTION**

- A. Examine substrates for compliance with requirements for moisture content and other conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. Refer to Section 09 21 16 (09255) - Gypsum Board Assemblies for the levels of gypsum board finish per [GA-214](#) required for a proper substrate to apply the wall coverings.
 - a. Wall Covering: Level 4 Finish required.
 - b. Graphic Wall Cover: Level 5 Finish required.
- B. Ensure surfaces to receive all covering are clean, true, and free to irregularities. Inspect surfaces before commencing work and report defects in writing to the Owner's representative.
- C. Ensure wall surface flatness tolerances do not vary more than **1/8 -inch** in **10 -feet**, nor vary at a rate greater than **1/16 -inch** per running foot.
- D. Schedule installation of wallcovering as late as possible in the construction schedule to prevent damage during construction and movement of materials.
- E. Inspect wall covering for defects. Do not install defective wall covering. Notify Owner's representative of any defects immediately.

1. Notify the Architect of variations in color or pattern match. Do not continue with work until instructed by Architect .

3.2 PREPARATION

- A. Comply with manufacturers written instructions for surface preparation.
- B. Test surfaces to receive wallcovering with a moisture meter. Do not install wallcovering on surfaces with a moisture content exceeding **4 percent**.
- C. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, and dirt.
- D. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
 1. Painted Surfaces: Treat areas susceptible to pigment bleeding.
 2. Metals: If not factory primed, clean and apply rust-inhibitive zinc primer.
 3. Moisture Content: Maximum of **5 percent** on new plaster, concrete, and concrete masonry units when tested with an electric moisture meter.
- E. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION - GENERAL

- A. General: Comply with wall-coverings manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

3.4 INSTALLATION - PRIMER

- A. Prime all new gypsum board with primer recommended by wall covering manufacturer. Apply primers full strength, no thinning permitted. .

3.5 INSTALLATION - WALLCOVERING

- A. Install wall-covering prior to installation of all wall mounted plumbing, cabinets, molding and electrical fixtures.
- B. Cut wall-covering panels in roll number sequence. Change run numbers at partition breaks and corners only. Install wall covering with no gaps or overlaps. Match pattern 72 inches above finish floor. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners. No horizontal seams. Remove air bubbles, wrinkles, blisters, and other defects. Trim edges for color uniformity, pattern match, and tight closure at seams and edges. Double cut seams.
 1. Install non-match panels on the hanging surface, reversing every other panel unless otherwise recommended by the manufacturer. Match side joints for continuity.

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2. Fill in over doors and windows as work progresses with panels cut in consecutive order from the roll.
3. Do not allow vertical joints to occur closer than **6 -inches** from outside corners not indicted to receive new corner guards.
 - a. Outside corners receiving corner guards should be used as a location to adjust wall-covering needing realignment due to "out of-plumb" walls.
- C. Notify the Owner's Representative immediately of variations in color or pattern match. Do not continue with work until instructed by the Owner's Representative.
- D. Refer to Joint Sealants Section 07 9200 for sealant application at edges of wallcoverings where the wallcovering meets other materials.

3.6 CLEANING

- A. Remove all excess adhesive from joints, wall mounted equipment, door frames, and other similar items. Use cleaning methods recommended by the wall-covering manufacturer. Replace strips that can not be cleaned.

- END OF SECTION -

- SECTION 09 8100 -**ACOUSTICAL INSULATION**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fiberglass acoustical ceiling system batt insulation
 - 2. Wool acoustical board insulation
 - 3. Fiberglass sound batt insulation.
 - 4. Auxiliary materials.
 - 5. Fasteners.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Section 01 9113 "General Commissioning Requirements".
- D. Section 06 2000.01 "Finish Carpentry (Courtyard)" for Courtyard interior carpentry, exposed to view, generally field fabricated, installed and finished. Coordinate with wood plank ceiling; acoustical board insulation specified in this Section.
- E. Section 06 2000.02 "Finish Carpentry (Residence Inn)" for Residence Inn interior carpentry, exposed to view, generally field fabricated, installed and finished. Coordinate with wood plank ceiling; acoustical board insulation specified in this Section.
- F. Section 07 2100 "Thermal Insulation" for thermal insulation applications and perimeter fire-containment systems.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

- B. ASTM B749 – Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
- C. ASTM C1104 - Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- D. ASTM C1320 - Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.
- F. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.
- G. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- H. Manufacturer's recommendations and specifications.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on tests performed by qualified independent testing laboratory evidencing compliance of fire performance characteristics, and other properties, based on comprehensive testing of current products.
- B. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700 "Closeout Procedures".
 - 2. Warranty: Submit specified warranty.

1.7 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
 - 1. Surface Burning Characteristic: ASTM E 84.

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2. Fire Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 FIBERGLASS ACOUSTICAL CEILING SYSTEM BATT INSULATION

- A. Basis of Design: Provide Select Sound Black Acoustic Blanket, by Owens Corning, Toledo, Ohio 43659, Tel: 1-800-GET-PINK, www.owenscorning.com. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
 1. Owens Corning .
 2. CertainTeed Corporation.
 3. Guardian Building Products, Inc.
 4. Johns Manville.
 5. Knauf Insulation.
- B. Black Acoustical Blanket cut to fit. Unfaced, Formaldehyde-Free Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of **25** and **50**, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 1. Standard thickness of **2 -inches** and in standard density of **1.5 pcf** (Type 150).
 2. Rolls of **72 -inches** standard width and in length of 50 **-feet** for **2 -inch** thickness.
 3. Product is composed of inorganic glass fibers.
 4. Product's mat face able to be cleaned by vacuuming.
 5. Product shall not cause corrosion greater than caused by sterile cotton to steel and aluminum, when tested in accordance with ASTM C665.
- C. Acoustical Performance (Tested to ASTM C423, Type A mounting). NRC: **0.80**.
- D. Surface Burning of Core Material (tested to UL 723, or CANULC-S102-M):
 1. Flame spread **25**, smoke developed **50** (Class A).
- E. Water vapor sorption - by weight (Tested to ASTM C1104):
 1. **< 3 percent** at **120°F (49°C)** at **95 percent** relative humidity.

- F. Fungi resistance: Meets all requirements of ASTM C1338

2.3 FIBERGLASS SOUND BATT INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide insulation products of one of the following:
1. Manufacturers of Glass Fiber Wall Insulation:
 - a. Johns Manville Insulations (Sound Shield Batts, 4 -inch thick, minimum).
 - b. Owens/Corning Fiberglas Corp. (Sound Attenuation Batts, 3-1/2 -inch thick, minimum).
 - c. CertainTeed Corp. (CertaSound Attenuation Batts, 3-1/2 -inch thick, minimum).
- B. Materials:
1. Sound Attenuation Batts: Fiberglass, unfaced, Formaldehyde-Free with a Fire Hazard Classification of 250-50 or less when tested in accordance with ASTM E-84-89a, Standard Test Method for Surface Burning Characteristics of Building Materials; ASTM C-665-88 Standard Specification for Mineral Fiber Blanket Thermal Insulation, Type 1, Class B, and Federal Specification HH-I-521F, Type I.

2.4 WOOL ACOUSTICAL BOARD INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide the following:
1. SelectSound Black Acoustic Board, by Owens Corning, One Owens Corning Parkway, Toledo, Ohio 43659, Tel: 1-800-GET-PINK, www.owenscorning.com.
 2. Thickness: 2 -inch
- B. Performance Requirements
1. Board shall be available in 24 -inch x 48-inch and 48-inch x 96-inch sizes.
 2. Acoustic board thickness shall have a Standard density of 3.0 pcf.
 3. Product shall be dimensionally stable with no capability for shrinking or warping.
 4. Product shall have a resilient composition with good resistance to damage from job-site impact.
 5. Product shall be composed of inorganic glass fibers.
 6. Product's mat face shall be able to be cleaned by vacuuming.
 7. Product shall not be susceptible to rot or mildew contamination.
 8. Product shall not cause corrosion greater than caused by sterile cotton to steel and aluminum, when tested in accordance with ASTM C665.
 9. Acoustical Performance (Tested to ASTM C423, Type A mounting).
 10. Surface Burning of Core Material (tested to UL 723, or CANULC-S102-M):
 - a. Flame spread 25, smoke developed 50.
 11. Water vapor sorption - by weight (Tested to ASTM C1104): <3% at 120°F (49°C) at 95% relative humidity.
 12. Fungi resistance: Meets all requirements of ASTM C1338.

2.5 AUXILIARY INSULATING MATERIALS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
1. Products: Subject to compliance with requirements, provide one of the following :
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Gemco; Spindle Type.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 -inch (0.762 mm) thick by 2 - inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 -inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
 - a. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gemco; 90-Degree Insulation Hangers.
 2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 -inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 -inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
 - a. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016 -inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 -inches (38 mm) square or in diameter.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; www.agmind.com RC Round Series or SC Square Series.
 - b. Gemco; www.gemcoinsulation.com Dome-Cap, R Round Series and/or S Square Series.
 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
 - d. Where indicated.
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch (25 mm), 2 inches (50 mm) or 3 inches (76 mm) between face of insulation and substrate to which anchor is attached – refer to Drawings and/or details for spacing required.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gemco; Clutch Clip, www.gemcoinsulation.com
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; TACTOO Adhesive. www.agmind.com
 - b. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
 - c. Gemco; Tuff Bond Hanger Adhesive, www.gemcoinsulation.com
- F. Wire and Insulation Supports: As manufactured by E-Z Wire Products or as recommended by insulation manufacturer.

2.6 MINERAL-WOOL BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
 1. Fibrex Insulations Inc.
 2. Owens Corning.
 3. Roxul Inc.
 4. Thermafiber.
- B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x Sq. Ft. /Btu x in. at 75 deg F.
 2. Thickness: 2 -inches unless shown otherwise (R-8.7).
- C. Reinforced-Foil-Faced, Mineral-Wool Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim Kraft, or foil-scrim polyethylene.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory.
 1. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated.
 - 1. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B. Extend insulation full thickness as indicated to envelop entire area to be insulated.
 - 1. Cut and fit tightly around obstructions, and fill voids with insulation.
 - 2. Remove projections that interfere with placement.
- C. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- D. Provide sizes (widths and thicknesses) to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths.
 - 1. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
 - 2. Install full lengths whenever possible to fill entire length of wall cavity.
- E. Install acoustical insulation batts in all stud partition walls. Install batts prior to installing gypsum panels unless batts are readily installed after panels have been installed on one side.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's written recommendations.
 - 1. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
 - 2. Place insulation at exterior wall construction, and where shown on Drawings in manner to insure continuous thermal barrier.
- B. Install unfaced batts in wall framing at all exterior wall cavities.
 - 1. Friction fit.
 - 2. Install batts above termination of gypsum wallboard utilizing 18 gauge wire perpendicular to the batt at **18 -inches** on center, or attach pin anchor at intervals required by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain **3-inch (76-mm)** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. For metal-framed wall cavities where cavity heights exceed **96 -inches (2438 mm)**, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Loose-Fill Insulation: Compact to approximately **40 percent** of normal maximum volume equaling a density of approximately **2.5 lb/cu. ft. (40 kg/cu. m)**.
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Install **3 -inch- (76-mm-)** thick, unfaced glass-fiber blanket insulation over suspended ceilings at partitions in a width that extends insulation **48 -inches (1219 mm)** on either side of partition.

3.6 PROTECTION

- A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.7 INSULATION SCHEDULE

- A. General: When spaces are also scheduled for building thermal insulation, install insulation as specified in Section 07 2100 "Thermal Insulation".
- B. Interior Partitions: Install Sound Attenuation Batts, from floor to underside of deck as noted on Drawings.
- C. Ceiling Systems: As indicated on drawings.
- D. Misc: All other locations as indicated on the drawings, or as required to complete an acoustical barrier between two adjacent spaces as indicated.

- END OF SECTION -

- SECTION 09 8453 -

PARTITION SOUND BARRIER MULLION TRIM CAPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Partition Sound barrier mullion trim caps providing sound transmission control at window mullions.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 07 9200 "Joint Sealants" for joint sealing.
- D. Section 08 4113 "Aluminum Framed Entrances and Storefronts" for storefront construction.
- E. Section 08 4413 "Glazed Aluminum Curtain Walls" for curtain wall construction.
- F. Section 09 2216 "Non-Structural Metal Framing" for interior wall construction.
- G. Section 09 2900 "Gypsum Board" for interior wall construction.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

- C. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.
- E. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- F. Manufacturer's recommendations and specifications.

1.5 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300 "Submittal Procedures".
- B. Product data for each type of insulation product specified.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sound barrier wall end cap system.
- C. Shop Drawings:
 - 1. Include typical dimensioned cross-section(s) at the location where drywall partition terminates at the perimeter curtain wall, indicating:
 - a. Dimensions
 - b. Finish
- D. Samples: For each exposed product and for each color and texture specified.
 - 1. Size: 12 -inches (304.8 mm).
- E. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 - 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each sound barrier mullion trim cap assembly, for ASTM E 90 tests performed by a qualified third party testing agency.
- C. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7700 "Closeout Procedures".
 - 2. Warranty: Submit specified warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of aluminum extrusions and anodizing shall be ISO-9001 certified.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Testing Agency Qualifications: ASTM E 90 testing to be performed by laboratory accredited by IAS as complying with ISO/IEC Standard 17025.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver sound barrier mullion trim caps until spaces to receive them are clean, dry, and ready for their installation.
- B. Store sound barrier mullion trim caps in original undamaged packaging inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace sound barrier mullion trim caps that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: (10) ten years limited warranty from date of Substantial Completion.
 - 2. Limited warranty does not cover adjacent products or improper installation.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. Sound Transmission:
 - 1. Single Sided Installations: STC 51 or better
 - 2. Double-Sided Installations: STC 57 or better
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Mullion trim cap to be sized to accommodate thermal movement.

2.2 MANUFACTURER

- A. Basis of Design: Provide MULL-it-OVER Trim Cap as manufactured by MULL-it-OVER Products, www.mullitoverproducts.com. Subject to compliance with requirements.

2.3 SYSTEM DESCRIPTION

- A. General: Provide sound barrier mullion trim caps of design, basic profile, materials, and operation indicated.
 - 1. Provide units with capability to accommodate variations in adjacent surfaces.
 - 2. Furnish units in lengths of sufficient additional length to allow for field trimming to required length to match variations in construction tolerances of adjacent systems.

2.4 MATERIAL - SOUND BARRIER MULLION TRIM CAP

- A. Sound Barrier Mullion Trim Cap:
 - 1. Products: MULL-it-OVER Products; Mullion Trim Cap, www.mullitoverproducts.com.
- B. Model / Profile:
 - 1. To be selected from the following as indicated in drawings and/or details:
 - a. 57 Classic Mullion Trim Cap.
 - b. 57 Flush Mullion Trim Cap.
 - c. Wide Mullion Trim Cap.
- C. Components:
 - 1. Aluminum Extrusions:
 - a. Thickness: 0.125 -inches.
 - b. Profile: As selected and approved by Architect to allow solid attachment and fastening to the partition wall framing.
 - 2. Sound Absorbing Foam:
 - a. Resistant to;
 - 1) Smoke.
 - 2) Flame.
 - 3) Microbial growth.
 - b. Fire Rating: ASTM E 84 Class 1.
 - c. Fungi Resistance: Zero rating per ASTM G 21.
 - 3. Compressible Foam: Between edge of extrusion and interior face of curtain wall glass.
 - a. Thickness: Standard 5/16 -inch (8 mm), compressible to 1/4 -inch (6 mm), or larger thickness to accommodate a larger mullion deflection.
 - 4. Fasteners:
 - a. Self Tapping or appropriate threaded fastener.
 - b. Compatible with all materials fasteners will contact with and not causing galvanic corrosion.
 - 5. Snap Cover: Snap-on fastener cover.

2.5 AUXILIARY MATERIALS

- A. Provide necessary and related parts and tools to complete installation.

2.6 FABRICATION

- A. Extrusions and generic profiles to be shipped in custom lengths as required to meet project requirements or shipped in standard incremental foot lengths and cut to exact length on jobsite.

2.7 FINISHES

- A. General: Exposed surfaces of exposed aluminum extrusion:
- B. Finishes: (Architect shall select from the following)
1. Clear anodized: Clear anodized finish in accordance with AA-M10 C22 A41 Class I (0.7 to 1.0 thick anodic coating)
 - b. Color as selected by Architect to match window system.
 2. Powder Coat Painted:
 - a. System: ColorChoice by Mull-It-Over.
 - b. Product: Powder coating.
 - c. Sheen: (Architect shall select from the following)
 - 1) Matte.
 - 2) Gloss.
 - d. Color: (Architect shall select from the following).
 - 1) Dark Bronze.
 - 2) Black.
 - 3) Bone White.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls and adjacent curtain wall for suitable conditions where sound barrier wall end cap will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with attachment.

3.3 INSTALLATION

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated.

1. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B. Measure and cut sound barrier wall end cap to proper lengths.
- C. Notch around horizontal mullions, sills, or other obstructions leaving appropriate gap for differential movement between the sound barrier wall end cap and the obstruction.
- D. Apply continuous bead of acoustical sealant to the acoustical foam surface that will be in contact with the drywall edge.
- E. Place sound barrier wall end cap on the vertical surface of the drywall partition wall and loosely install fasteners in the top and bottom slotted holes of the wall end cap.
- F. Plumb the wall end cap leaving recommended gap spacing of a minimum **5/16 -inch** between the interior glass surface and the aluminum return leg of the wall end cap. The closed cell foam gasket material will be in contact with the glass surface allowing for differential movement between the mullion cap and the curtain wall. Increase the gap spacing if recommended by the engineer of record or curtain wall manufacturer.
- G. Tighten top and bottom fasteners to secure end cap.
- H. Install additional fasteners at **12 -inches** on center, minimum.
- I. Install snap cover to conceal fasteners.
- J. Apply sealant at joints of dissimilar materials as desired.

3.4 PROTECTION

- A. Protect sound barrier wall end caps from damage during installation, general construction activities, and until turnover of structure.

3.5 CLEANING

- A. After work is complete in adjacent areas, clean exposed surfaces with suitable cleaner that will not harm or attack the finish.

- END OF SECTION -

- SECTION 09 9113 -

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel, primed and unprimed.
 - 2. Galvanized metal.
 - 3. Concrete masonry units (CMU).
 - 4. Adhered (thin) brick masonry.
 - 5. Concrete.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
- C. Pertinent Sections specifying sealants or referencing this Section for sealant products and Execution Requirements.
- D. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
- E. Section 09 9123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
- F. Section 09 9600 "High-Performance Coatings" for exterior special paint coatings .

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 -inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 3. VOC content.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 - 1. Coatings Quantity: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied and refer to division 1 specification for additional requirements.
 - a. Provide two copies of the mixing formula to the Architect in addition to the instructions attached to paint containers.
 - 2. Refer to Section 01 7843 "Spare Parts"

EXTERIOR PAINTING

1.8 CLOSEOUT SUBMITTAL

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.
- C. At completion of Work of this Section, submit manufacturer's or distributor's numbered invoices showing type and quantity of products used on this Project.
- D. Coating Maintenance Manual: Upon conclusion of the project, the contractor and paint manufacturer/supplier for each paint manufacturer used shall furnish a Coating Maintenance Manual.
 - 1. Manual shall include the following.
 - a. Area Summary with Finish Schedule.
 - b. Area Detail designating where each product, color and finish was used.
 - c. Product Data pages.
 - d. Material Safety Data Sheets (MSDS).
 - e. Care and Cleaning instructions.
 - f. Touch-up procedures.
 - g. Color samples of each color and finish used.
 - 2. Manufacturers other than Sherwin Williams shall provide a manual which matches or exceeds the content of a "Custodian Project Color and Project Information Report" as provided by Sherwin Williams.

1.9 QUALITY ASSURANCE

- A. MPI Standards: Preparation and Workmanship; Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated for new construction and re-finished surfaces.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect of problems anticipated using the materials specified.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.11 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.12 EXTRA MATERIAL

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Refer to Section 01 7843 "Spare Parts"

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Components specified in this Section manufactured by Sherwin Williams are the standard of quality against which the architect will judge equivalency of materials. Other acceptable manufacturers are listed below.
 - 1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - a. The Sherwin Williams Co., www.sherwilliams.com
 - b. Dunn-Edwards Corporation, www.dunnedwards.com
 - c. Glidden Professional; (previously ICI Paints) www.gliddenprofessional.com
 - d. Vista Paints, www.vistapaint.com

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Paint-material containers not displaying manufacturer's product identification will **NOT** be acceptable.
- C. Detailed specifications for the various surfaces are shown in the Paint Schedule at the end of this Section. If these specifications conflict with the recommendations of the manufacturer, this discrepancy shall be brought to the attention of the Owner's Representative, the Owner's Representative shall decide which method shall be followed.

PART 3 - EXECUTION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.

EXTERIOR PAINTING

1. Application of coating indicates acceptance of surfaces and conditions.

- D. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Portland Cement Plaster: 12 percent.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- H. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. <Insert mechanical items to be painted>.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

EXTERIOR PAINTING

- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINT SCHEDULE

- A. Architectural Exposed Steel (AESS):
 - 1. Ferrous Metals: Refer to Section 09 9600 High-Performance Coatings.
 - 2. Galvanized Metals: Refer to Section 09 9600 High-Performance Coatings.
- B. Exterior Plaster: : Acrylic finish coat per Section 09 2513 "Acrylic Modified Portland Cement Plastering".
- C. Cast-in-Place Concrete, Exposed Foundation Walls:
 - 1. Satin Acrylic, Early Moisture Resistant Topcoat: Two finish coats over a primer.
 - a. Primer Coat (3.2 mils):
 - 1) SW Loxon Acrylic Primer A24W8300
 - 2) D-E EFF-STOP Premium, Masonry Primer/Sealer (ESPR00)
 - b. Intermediate (1.5 mils):
 - 1) SW Resilience Latex Satin K43
 - 2) D-E EVERSHIELD, Exterior /Interior Low Sheen Paint (EVSH40 Series)
 - c. Final Coats (1.5 mils):
 - 1) SW Resilience Latex Satin K43
 - 2) D-E EVERSHIELD, Exterior /Interior Low Sheen Paint (EVSH40 Series)
- D. Concrete Masonry Walls:
 - 1. Gloss Acrylic-Enamel Finish: Two finish coats over a block filler.
 - a. Primer Coat (8.0 mils):
 - 1) SW PrepRite Block Filler B25W25
 - 2) D-E Smooth BLOCFIL Premium, Interior/Exterior Concrete Block Filler (SBPR00)
 - b. Intermediate (1.3 mils):
 - 1) SW A-100 Exterior Latex Gloss A8
 - 2) D-E EVERSHIELD, Exterior /Interior Gloss Paint (EVSH60 Series)
 - c. Final Coats (1.3 mils):
 - 1) SW A-100 Exterior Latex Gloss A8
 - 2) D-E EVERSHIELD, Exterior /Interior Gloss Paint (EVSH60 Series)
- E. Adhered (Thin) Brick Masonry Surfaces: Verify sheen with Architect prior to mockups.
 - 1. Gloss Acrylic-Enamel Finish: Two finish coats over a block filler.
 - a. Primer Coat (8.0 mils):
 - 1) SW PrepRite Block Filler B25W25

- 2) D-E Smooth BLOCFIL Premium, Interior/Exterior Concrete Block Filler (SBPR00)
 - b. Intermediate (1.3 mils):
 - 1) SW A-100 Exterior Latex Gloss A8
 - 2) D-E EVERSHIELD, Exterior /Interior Gloss Paint (EVSH60 Series)
 - c. Final Coats (1.3 mils):
 - 1) SW A-100 Exterior Latex Gloss A8
 - 2) D-E EVERSHIELD, Exterior /Interior Gloss Paint (EVSH60 Series)
- F. Metal Surfaces: Non-Ferrous Metals and Zinc-Coated (Galvanized) Steel.
 - 1. Semi-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer Coat (3.0 mils):
 - 1) SW ProCryl Universal Primer B66-310
 - 2) D-E BLOC-RUST Premium, Rust-Preventative Metal Primer (BRPR00 Series)
 - 3) –OR- D-E ULTRASHIELD Interior/Exterior DTM Gray Primer (ULDM00-0-GR)
 - b. Intermediate (3.0 mils):
 - 1) SW Metalatex Semi-Gloss Coating B42
 - 2) ULTRASHIELD Interior/Exterior Low Sheen Paint (ULSH40)
 - c. Final Coats (3.0 mils):
 - 1) SW Metalatex Semi-Gloss Coating B42
 - 2) ULTRASHIELD Interior/Exterior Low Sheen Paint (ULSH40)
- G. Metal Surfaces: Ferrous Metals.
 - 1. Ferrous Metals - Uncoated:
 - 2. Semi-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer Coat (3.0 mils):
 - 1) SW ProCryl Universal Primer B66-310
 - 2) D-E BLOC-RUST Premium, Rust-Preventative Metal Primer (BRPR00 Series)
 - 3) –OR- D-E ULTRASHIELD Interior/Exterior DTM Gray Primer (ULDM00-0-GR)
 - b. Intermediate (3.5 mils):
 - 1) SW Metalatex Semi-Gloss Coating B42
 - 2) ULTRASHIELD Interior/Exterior Low Sheen Paint (ULSH40)
 - c. Final Coats (3.5 mils):
 - 1) SW Metalatex Semi-Gloss Coating B42
 - 2) ULTRASHIELD Interior/Exterior Low Sheen Paint (ULSH40)

- END OF SECTION -

- SECTION 09 9123 -**INTERIOR PAINTING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. This Section includes surface preparation and the application of paint materials to exposed interior and exterior items and surfaces scheduled. Surface preparation, prime and finish coats specified are in addition to shop-priming and surface treatments.
 2. Paint all exposed surfaces, whether or not colors are designated, except where a surface or material is indicated not to be painted or is to remain natural. Where an item or surface is not mentioned, paint the same color as similar adjacent materials or surfaces. If color or finish is not designated, the Owner will select from standard colors or finishes available.
 3. Except in mechanical and electrical rooms, paint all exposed plumbing, heating, fire protection, and electrical material to match the walls and ceilings of that area unless noted otherwise. This shall include, but not be limited to, pipes, sprinkler piping, insulation, conduit, ducts, access panels, grilles, diffusers, hangers, exposed steel and iron supports, HVAC and electrical equipment that do not have a factory applied finish, whether the adjacent surfaces receive paint or not, and the like. Include dampers or baffles behind grilles.
 4. Unless noted otherwise, painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, sprinkler heads, or labels.
 - a. All louvers and grilles to be painted to color as shown on Interior Finish Specifications Drawings.
 - b. Labels: Do not paint over Underwriter's Laboratories, FMG or other code-required labels, or equipment name, identification, performance rating, or nomenclature plates.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".

- C. Section 08 1113 "Steel Doors and Frames": Prime coat on new hollow metal work shall be furnished under this Section.
- D. Prime coat on lintels shall be furnished under the Division 05 Sections.
- E. Section 09 2900 "Gypsum Board" for spray-applied textured coating.
- F. Section 09 2116.23 "Gypsum Board Shaft-Wall Assemblies".
- G. Section 09 9123.13 "Interior Paint Schedule".
- H. Section 09 9600 "High-Performance Coatings": Prime and finish coat for exposed exterior ferrous metal items and ferrous metal items located within Interior Pool areas shall be furnished under that Section. Refer to that Section for items included.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. [Underwriter's Laboratories, Inc. \(UL\)](#) Standards.
- C. [FM Global \(FMG\)](#): Standards.
- D. [ASTM International \(ASTM\)](#) Publications:
 - 1. D16 "Standard Terminology for Paint, Related Coatings, Materials, and Applications".
 - 2. D2824 "Standard Specification for Aluminum-Pigmented Asphalt Roof Coatings, Nonfibered, Asbestos Fibered, and Fibered without Asbestos".
 - 3. D1187 "Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Re-approved 2002)".
- E. [Society of Protective Coatings \(SSPC\)](#):
 - 1. Surface Preparation Standards and Specifications.
 - a. SSPC-SP 1, "Solvent Cleaning".
 - b. SSPC-SP 11, "Power Tool Cleaning to Bare Metal".
- F. [The Painting and Decorating Contractors of America \(PDCA\)](#):
 - 1. PDCA P5-94 "Benchmark Sample Procedures for Paint and Other Decorative Coating Systems".
- G. [Code of Federal Regulations \(CFR\)](#) Publications:
 - 1. 40 CFR, Part 59, Subpart D 2001, "National Volatile Organic Compound Emission Standards for Architectural Coatings"
- H. [Green Seal, Inc.](#) Publications:
 - 1. GS-11 "Green Seal Environmental Standard for Paints", First Edition 1993.

1.5 DEFINITIONS:

- A. General: Standard coating terms defined in [ASTM](#) D16 apply to this Section.

INTERIOR PAINTING

- B. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. VOC Submittals:
1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
 2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.
- E. Submit "Letter of Conformance" in accordance with Section 01 3300 indicating specified items selected for use in project with the following supporting data.
1. Product Data: Submit manufacturer's technical information, label analysis, and application instructions for each paint material proposed for use.
 2. Samples: Submit two representative samples of each major type of surface or material. Do not proceed with final painting until samples are approved.
 3. Color Charts: In duplicate, for all paints, stains and special coatings. Identify with numbers used on the;
 - a. Finish Specifications Drawings
 - b. Section 09 9123.13 "Interior Paint Schedule"
 4. Painting Schedule: In a form similar to the schedule herein outlining the type of paint to be used for each category, application, and color. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 5. Quality Control Submittals:
 - a. Certifications: Manufacturer's statement that paint materials conform to current regulations relating to lead content and air pollution emission requirements.
- F. Written Permission in writing by the Owner's Representative for the use of Mechanical application methods.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.

1. Coatings Quantity: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied and in compliance with division 1 specification..
 - a. Provide two copies of the mixing formula to the Architect in addition to the instructions attached to paint containers.
2. Refer to Section 01 7843 "Spare Parts"

1.8 CLOSEOUT SUBMITTAL

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.
- C. At completion of Work of this Section, submit manufacturer's or distributor's numbered invoices showing type and quantity of products used on this Project.
- D. Coating Maintenance Manual: Upon conclusion of the project, the contractor and paint manufacturer/supplier for each paint manufacturer used shall furnish a Coating Maintenance Manual.
 1. Manual shall include the following.
 - a. Area Summary with Finish Schedule.
 - b. Area Detail designating where each product, color and finish was used.
 - c. Product Data pages.
 - d. Material Safety Data Sheets (MSDS).
 - e. Care and Cleaning instructions.
 - f. Touch-up procedures.
 - g. Color samples of each color and finish used.
 2. Manufacturers other than Sherwin Williams shall provide a manual which matches or exceeds the content of a "Custodian Project Color and Project Information Report" as provided by Sherwin Williams.

1.9 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- B. Coordination of Work: Review Sections in which primers are provided to ensure compatibility of the total systems for various substrates.
- C. Material Quality: Provide the manufacturer's best quality trade sale type paint material of the various types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude of equal products of other manufacturers.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000.

- B. Deliver materials to the job site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with trade name and manufacturer's instructions.
 - 1. Product Name or Title of Material
- C. Product Description (Generic Classification or Binder Type)
 - 1. Manufacturer's Stock Number and Date of Manufacture
 - 2. Contents by Volume, for Pigment and Vehicle Constituents
 - 3. Thinning Instructions
 - 4. Application Instructions
 - 5. Color Name and Number
 - 6. VOC Content
- D. Approved materials without the above information will NOT be allowed on the Project site.
- E. Store materials not in actual use in tightly covered containers at a minimum ambient temperature of 50 degrees F. in a well-ventilated area. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.
- F. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary precautionary measures to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing, and application of coatings.

1.11 PROJECT CONDITIONS:

- A. Do not apply coatings in snow, rain, fog, or mist, or when the relative humidity exceeds 85 percent, or at temperatures less than 5 degrees F. above the dew point, or to damp or wet surfaces, unless otherwise permitted by manufacturer's printed instructions. Allow wet surfaces to dry thoroughly and attain the temperature and conditions specified before proceeding with or continuing the coating operation.

1.12 WASTE MANAGEMENT AND DISPOSAL

- A. Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable government agencies having jurisdiction

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 MANUFACTURERS

- A. Except where noted otherwise, all finishing materials, thinners, etc., shall be the best quality, first line materials as manufactured by one of the following manufacturers:
1. Avendra, LLC. Preferred Manufacturers:
 - a. Sherwin-Williams Co. (S-W) (800-321-8194)
 2. Approved Manufacturers:
 - a. AkzoNobel Corporate, www.akzonobel.com, formally ICI
 - b. Benjamin Moore & Co. (BM) (888-236-6667)
 - c. Sherwin Williams, www.sherwin-williams.com
 - d. Glidden Professional, a PPG Architectural Coatings, www.glidden.com (888-615-8169)
 - e. PPG Architectural Finishes, Inc. – Pittsburgh Paints (888-441-9695).

2.3 PAINT MATERIALS - GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated.
1. Paint-material containers not displaying manufacturer's product identification will NOT be acceptable.
 - a. Recycled content paints and primers will not be permitted for interior or exterior application.
 - b. Toxicity/IEQ: Comply with applicable regulations regarding toxic and hazardous materials, and as specified. Paints and coatings must meet or exceed the VOC and chemical component limits.
 - 1) Interior paint:
 - a) Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
 - 2) Exterior paint:
 - a) Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
 - b) Refer to Section 09 9113 "Exterior Painting"
 - c) Section 09 9600 "High-Performance Coatings"
- C. Raw linseed oil, turpentine, benzene, gloss oil, or coal oil shall not be used in any of the materials for painting work.
- D. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:

Products

Flat Paints, Coatings and Primers:

VOC Content

Refer to Section 01 6116

INTERIOR PAINTING

	"Volatile Organic Compound (VOC) Restrictions"
Non-Flat Paints, Coatings and Primers:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Floor Coatings:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Stains:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Clear Wood Finishes, Varnishes and Sanding Sealers:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Clear Wood Finishes, Lacquers:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Exterior Flat Paints, Coatings and Primers:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Exterior Non-Flat Paints, Coatings and Primers:	Refer to Section 01 6116
	"Volatile Organic Compound (VOC) Restrictions"
Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).	
Restricted Components: Paints and coatings shall not contain any of the following:	
Acrolein.	
Acrylonitrile.	
Antimony.	
Benzene.	
Butyl benzyl phthalate.	
Cadmium.	
Di (2-ethylhexyl) phthalate.	
Di-n-butyl phthalate.	
Di-n-octyl phthalate.	

1,2-dichlorobenzene.
Diethyl phthalate.
Dimethyl phthalate.
Ethylbenzene.
Formaldehyde.
Hexavalent chromium.
Isophorone.
Lead.
Mercury.
Methyl ethyl ketone.
Methyl isobutyl ketone.
Methylene chloride.
Naphthalene.
Toluene (methylbenzene).
1,1,1-trichloroethane.
Vinyl chloride.

2.4 SPAR VARNISH

- A. Modified alkyd resin meeting federal regulations for lead and other heavy metals.
- B. Clear, gloss finish.
- C. Apply varnish on exposed ends of millwork as required in Section 12 30 00 (06400) - Architectural Woodwork and all field cuts in top and bottom rails of wood doors shall be sealed with two coats of varnish.

2.5 PROTECTIVE COATINGS

- A. Bituminous Paint: Acid and alkali resistant type conforming to [ASTM](#) D1187.
- B. Zinc Chromate Primer: Standard zinc chromate primer, selected from manufacturers listed in this Section.
- C. Aluminum Pigmented Paint: Fibrated aluminum complying with [ASTM](#) D2824, Type IV.
- D. Apply protective coating, bituminous paint, to isolate aluminum member as required.

2.6 PAINT SCHEDULE

- A. Detailed specifications for the various surfaces are shown in the Paint Schedule. If these specifications conflict with the recommendations of the manufacturer, this discrepancy shall be brought to the attention of the Owner's Representative, the Owner's Representative shall decide which method shall be followed.

INTERIOR PAINTING

- B. Refer to Paint Schedule at the end of this Section.

2.7 COLOR SAMPLES:

- A. The Contractor shall furnish samples of all finishes in triplicate and obtain the approval of color match before starting work. Final colors must match exactly with the approved sample. Colors selection and quantity of different colors, as shown on Drawings, and approved by Owner's Representative.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with requirements. Do not begin application until unsatisfactory conditions have been corrected.
 - 1. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

3.2 SURFACES TO BE COATED

- A. Paint access doors, panels, registers, diffusers, light fixture trim, metal speaker covers and grilles the same color as adjacent surfaces. Paint access doors and panels in open position.
- B. Paint interiors of ducts showing through registers and grilles flat black.
- C. Paint prime coated or previously painted hinges the same as door frame to which they are attached.
- D. Finish edges of doors to match faces.
- E. Do not paint electrical device face plates or devices, sprinkler heads, smoke alarms or thermostats/covers.
- F. Unless otherwise directed, remove and spray paint metal items/products that are removable such as vents, registers, access panels, covers, louvers and diffusers. Reinstall upon completion.

3.3 PREPARATION:

- A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and items in place that are not to be painted, or provide protection prior to surface preparation and painting. Remove items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting, reinstall items removed using workmen skilled in the trades involved.
- B. Clean surfaces before applying paint or surface treatments. Schedule cleaning and painting so dust and other contaminants will not fall on wet, newly painted surfaces.

- C. Provide protection for adjacent surfaces as necessary to prevent paint from coming into contact with adjacent materials not scheduled for painting.

3.4 SURFACE PREPARATION:

- A. Clean and prepare surfaces to be painted in accordance with manufacturer's instructions for each particular substrate condition. Notify Architect in writing of problems anticipated using specified finish coat material with substrates primed by others.
- B. Cementitious Surfaces: Prepare concrete, concrete masonry, cement plaster and similar surfaces to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze.
 - 1. Determine alkalinity and moisture content of surfaces to be painted. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 - 2. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry and vacuum before painting.
 - 3. At areas to receive epoxy paint, clean concrete with muriatic acid, wash per manufacturers' recommendations.
- C. Ferrous Metals: Clean non-galvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.
 - 1. Touch-up shop-applied prime coats that have been damaged, and bare areas. Wire-brush, clean with solvents, and touch-up with the same primer as the shop coat.
 - 2. At areas to receive epoxy paint, prepare steel surfaces to SSPC-SP11 power tool clean.
- D. Galvanized Surfaces: Utilize SSPC-SP1 solvent cleaning and chemical wash (tri-sodium phosphate). Power wash with tri-sodium phosphate type cleaner (5 percent solution at 140 degrees F.) and solvent clean after rinsing and drying with a non-petroleum based solvent cleaner so that surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock, by mechanical methods.
 - 1. Touch-up shop-applied prime coats that have been damaged, and bare areas. Wire-brush clean with solvents, and touch-up with the same primer as the shop coat.
- E. Wood Surfaces:
 - 1. General:
 - a. Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

- b. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- c. Delete subparagraphs below if these requirements are specified in other Sections.
- d. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
- e. When transparent finish is required, backprime with spar varnish.
- f. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
- g. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

3.5 MATERIALS PREPARATION:

- A. Mix and prepare paint in accordance with manufacturer's directions.
- B. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain before using.
- C. Use only thinners approved by manufacturer, and only within recommended limits.

3.6 APPLICATION:

- A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
- B. Paint colors, surface treatments, and finishes are indicated in "schedules."
- C. The number of coats and film thickness required is the same regardless of application method. Do not apply succeeding coats until previous coat has cured. Sand between applications where required to produce a smooth, even surface. Apply additional coats when undercoats or other conditions show through final coat, until paint film is of uniform finish, color, and appearance.
- D. The term "exposed surfaces" includes areas visible when permanent or built-in items are in place. Extend coatings in these areas to maintain system integrity and provide desired protection.
- E. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- F. Omit primer on metal surfaces that have been shop-primed, unless primer becomes worn, damaged, or more than six months old from date of delivery to job site.
- G. Paint all edges of every door to match faces, including top and bottoms.

3.7 MINIMUM COATING THICKNESS:

- A. Apply materials at the manufacturer's recommended spreading rate. Provide total dry film thickness of the system as recommended by the manufacturer.

3.8 BLOCK FILLERS:

- A. Apply block fillers at a rate to ensure complete coverage with pores filled.

3.9 PRIME COATS:

- A. Before application of finish coats, apply a prime coat as recommended by the manufacturer to material required to be painted or finished, and has not been prime coated by others.
- B. Tinting of primers will not be permitted.
- C. Re-coat primed and sealed substrates where there is evidence of suction spots or unsealed areas in the first coat to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- D. Back Priming:
- E. All wood trim shall be back primed before installation. Spot prime all ends of trim.

3.10 BRUSH APPLICATION:

- A. Brush-out and work brush coats into surfaces in an even film. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Draw neat glass lines and color breaks. Apply primers and first coats by brush unless manufacturer's instructions permit use of mechanical applicators.

3.11 ROLLER APPLICATION

- A. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.

3.12 MECHANICAL APPLICATIONS:

- A. Mechanical methods for paint application will ONLY be permitted by written permission of the Architect. All suite entry doors must be brush applied.

3.13 FIELD QUALITY CONTROL

- A. Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.
- B. Where touch-ups occur, match color and sheen of existing surface. Touch-ups must blend invisibly, or painting must be extended to nearest corner or other termination point, as acceptable to the Owner's Representative.

INTERIOR PAINTING

- C. Painted exterior and interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the Owner's Representative:
1. Brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
 4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 5. Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).
 6. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than **48 –inches**.
 7. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than **48 –inches**.
 8. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
 9. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
- D. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
 2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
 - a. Dry Film Thickness.
 - b. Volume Solids
 - c. Content of the material actually delivered to the site as compared to the product's published label analysis
 3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.14 CLEANING

- A. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
- B. Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers / strippers in accordance with the safety requirements of authorities having jurisdiction

- C. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing, scraping, or other proper methods, using care not to scratch or damage adjacent finished surfaces.
- D. Protect work of other trades, whether to be painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- E. Provide "Wet Paint" signs to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations. At completion of construction activities of other trades, touch-up and restore damaged or defaced painted surfaces.

- END OF SECTION -



PAIN T SCHEDULE (Change Bulletin No. 3)

DESCRIPTION				MANUFACTURER														
Type & Surface	Luster	Max VOC Content ² (g/L)	No. of Coats	SHERWIN-WILLIAMS			BENJAMIN MOORE			GLIDDEN PROFESSIONAL			PPG ARCHITECTURAL FINISHES					
				Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ³ (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ³ (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ³ (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ³ (Y or N)			
1. Interior Ferrous Metal (Not Galvanized and Shop Primed)	Acrylic Latex Semi-Gloss	250	1	Pro Industrial Pro-Cryl Universal Primer (B66W310)	3.00	Y	Acrylic Metal Primer (P04)	1.50	N	52	Devflex WB PF DTM Primer & Finish (4020)	2.20-3.50	Y	91	PittTech Plus 90-912 DTM Metal Primer	2.00-3.00	Y	90
		150	2	Solo Acrylic Semigloss (A76W51)	1.50	Y	<50	Eco Spec Interior Latex Semi Gloss Enamel (N376)	1.40	Y	0	Lifemaster Advanced Oil Semi-Gloss Enamel (1506)	1.50-2.00	Y	48	Speedhide 6-1510 Interior Alkyd WB Semi Gloss	1.80	Y
2. Interior Ferrous Metal (Galvanized)	Acrylic Latex Semi-Gloss	250		Self Priming- No Primer Required			Eco Spec Interior Latex Primer Sealer (N372)	1.00	Y	0	Devflex WB PF DTM Primer & Finish (4020)	2.20-3.50	Y	91	PittTech Plus 90-912 DTM Metal Primer	2.00-3.00	Y	90
		150	2	Solo Acrylic Semigloss (A76W51)	1.50	Y	<50	Eco Spec Interior Latex Semi Gloss Enamel (N376)	1.40	Y	0	Lifemaster Advanced Oil Semi-Gloss Enamel (1506)	1.50-2.00	Y	48	Speedhide 6-1510 Interior Alkyd WB Semi Gloss	1.80	Y
3. Not Used																		
4. Interior Pipes, Ductwork, & Mechanical Equipment (Not Galvanized)	Acrylic Latex Eggshell	150	1	Pro Industrial Pro-Cryl Universal Primer (B66W310)	3.00	Y	Fresh Start All-Purpose 100% Acrylic Primer (023)	1.20	N	49	Devflex WB PF DTM Primer & Finish (4020)	2.20-3.50	Y	91	PittTech Plus 90-912 DTM Metal Primer	2.00-3.00	Y	90
		150	1	ProMar 200 ZeroVOC Interior Latex Egg-Shel (B20W2651)	1.70	Y	0	Eco Spec Interior Latex Eggshell Enamel (N374)	1.40	Y	0	Lifemaster Advanced Oil Semi-Gloss Enamel (1502)	1.50-2.00	Y	<50	Speedhide 6-1410 Interior Alkyd WB Satin	1.50	Y

MANUFACTURER															
DESCRIPTION				SHERWIN-WILLIAMS			BENJAMIN MOORE			GLIDDEN PROFESSIONAL			PPG ARCHITECTURAL FINISHES		
Type & Surface	Luster	Max VOC Content ² (g/L)	No. of Coats	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	VOC ² (g/L)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	VOC ² (g/L)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	
5. Interior Pipes, Ductwork, & Mechanical Equipment (Galvanized)	Acrylic Latex Eggshell	150	1	Pro Industrial Primer (B66W310)	3.00	Y	<100	Eco Spec Interior Latex Primer Sealer (N372)	1.00	Y	0	Devflex WB PF DTM Primer & Finish (4020)	2.20-3.50	Y	
		150	1	ProMar 200 ZeroVOC Interior Latex Eg-Shel (B20W2651)	1.70	Y	0	Eco Spec Interior Latex Eggshell Enamel (N374)	1.40	Y	1	Lifemaster Advanced Oil Semi-Gloss Enamel (1502)	1.50-2.00	Y	
6. Interior Gypsum Board (New)	Acrylic Latex Eggshell	150	1	ProMar 200 ZeroVOC Interior Latex Wall Primer (B28W2600)	1.50	Y	0	Eco Spec Interior Latex Primer Sealer (N372)	1.00	Y	0	PVA Wall Interior Water-Based Primer (1030-1200)	1.50	Y	
		150	2	ProMar 200 ZeroVOC Interior Latex Eg-Shel (B20W2651)	1.70	Y	0	Eco Spec Interior Latex Eggshell Enamel (N374)	1.40	Y	0	Ultra Hide No VOC Interior Eggshell Finish (1411)	1.30-1.50	Y	
7. Interior Gypsum Board (New)	Acrylic Latex Flat	150	1	ProMar 200 ZeroVOC Interior Latex Wall Primer (B28W2600)	1.50	Y	0	Eco Spec Interior Latex Primer Sealer (N372)	1.00	Y	0	PVA Wall Interior Water-Based Primer (1030-1200)	1.50	Y	
		50	2	ProMar 400 ZeroVOC Interior Latex Flat (B30W4651)	1.20	Y	0	Eco Spec Interior Latex Flat (N373)	1.20	Y	0	Ultra Hide No VOC Interior Flat Finish (1209)	1.30-1.50	Y	
Note: The following item 8 can be used for locations where odor may be a problem.															
8. Interior Gypsum Board or Plaster (New)	Acrylic Latex Eggshell	150	1	ProMar 200 ZeroVOC Interior Latex Wall Primer (B28W2600)	1.50	Y	0	Eco Spec Interior Latex Primer Sealer (N372)	1.00	Y	0	Lifemaster No VOC Primer-Sealer (9116)	1.30	Y	
		150	2	ProMar 200 ZeroVOC Interior Latex Eg-Shel (B20W2651)	1.70	Y	0	Eco Spec Interior Latex Eggshell Enamel (N374)	1.40	Y	0	Ultra Hide No VOC Interior Eggshell Finish (1411)	1.30-1.50	Y	
9a. Not Used															
9b. Not Used															

DESCRIPTION				MANUFACTURER											
Type & Surface	Luster	Max VOC Content ² (g/L)	No. of Coats	SHERWIN-WILLIAMS			BENJAMIN MOORE			GLIDDEN PROFESSIONAL			PPG ARCHITECTURAL FINISHES		
				Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)
Note: The following Item 10a is for use at mildew problem areas or where a moisture barrier is required at Interior Gypsum Board or Plaster.															
Note: The following Item 10a is a VOC compliant specification with a lower VOC Content. Cost of Benjamin Moore product 10b may be higher than 10a. Select 10a or 10b and delete products not used for Project.															
10a. Interior Gypsum Board or Plaster (New or Previously Painted)	Acrylic Latex Satin	150	1	ProMar 200 ZeroVOC Interior Latex Wall Primer (B28W2600)	1.50	Y	Eco Spec Interior Latex Primer Sealer (N372)	1.00	Y	Vapor Barrier Water-Based Primer-Sealer (1060-1200)	1.36	Y	SealGrip Perm Sealer Vapor Barrier 17-9801	1.60	Y
		150	2	ProMar 200 ZeroVOC Interior Latex Eg-Shel (B20W2651)	1.70	Y	Eco Spec Interior Latex Eggshell Enamel (N374)	1.40	Y	Ultra Hide No VOC Interior Eggshell Finish (1411)	1.30-1.50	Y	Speedhide 6-4310 Zero VOC Interior Latex Eggshell	1.40	Y
Note: The following Item 10b is for use at mildew problem areas or where a moisture barrier is required at Interior Gypsum Board or Plaster.															
Note: The following Item 10b is a VOC compliant specification with the Benjamin Moore product having a higher VOC Content. Select 10a or 10b and delete products not used for Project.															
10b. Interior Gypsum Board or Plaster (New or Previously Painted)	Acrylic Latex Satin	150	1	ProMar 200 ZeroVOC Interior Latex Wall Primer (B28W2600)	1.50	Y	Self Priming - No Primer Required			Vapor Barrier Water Based Primer-Sealer (1060-1200)	1.36	Y	SealGrip Perm Sealer Vapor Barrier 17-9801	1.60	Y
		150	2	ProMar 200 ZeroVOC Interior Latex Eg-Shel (B20W2651)	1.70	Y	Aura Eggshell Waterborne Interior Paint (0524)	1.80	Y	Ultra Hide No VOC Interior Eggshell Finish (1411)	1.30-1.50	Y	Speedhide 6-4310 Zero VOC Interior Latex Eggshell	1.40	Y
Note: The following Item 11a is a low VOC compliant specification and is to be used for all LVP Projects. Select 11a or 11b and delete products not used for Project. Aura has the equivalent performance of Epoxy Item 11b.															
11a. Interior Gypsum Board or Plaster (Except at Indoor Pools and Not exposed to Water)	Acrylic Latex Eggshell	150	2	Emerald Interior Latex Satin (K36Series) Self Priming-No primer needed	1.70	Y	Aura Eggshell Waterborne Interior Paint (0524)	1.80	Y				Pure Performance 911.50 300 Zero VOC Eggshell Self Priming	1.50	Y
11b. Interior Gypsum Board or Plaster (Except at Indoor Pools and Not exposed to Water)	Epoxy Eggshell	150	1	ProMar 200 ZeroVOC Interior Latex Eg-Shel (B20W2651)	1.70	Y				Gripper Multi-Purpose Interior/Exterior Water-Based Primer Sealer (3210-1200)	1.50-2.00	Y	SealGrip 17-921	1.60	Y
11c. Not Used				ProIndustrial 0VOC 2.50 - 3.00 Waterbased Epoxy (B73W111)	2.50 - 3.00	Y				PittGlaze WB 116-310 WB Acrylic Epoxy Eggshell	1.50	Y	PittGlaze WB 116-310 WB Acrylic Epoxy Eggshell	1.50	Y

DESCRIPTION				MANUFACTURER											
Type & Surface	Luster	Max VOC Content ² (g/L)	No. of Coats	SHERWIN-WILLIAMS			BENJAMIN MOORE			GLIDDEN PROFESSIONAL			PPG ARCHITECTURAL FINISHES		
				Products	Dry Mill Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mill Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mill Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mill Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)
12a. Interior Gypsum Board - Indoor Pool, Storage room/off pool and Open Bar room, refer to Section 09 9627 "High Humidity Texture Acrylic Coatings"															
12b. Not Used															
13. Not Used															

MANUFACTURER															
DESCRIPTION				SHERWIN-WILLIAMS			BENJAMIN MOORE			GLIDDEN PROFESSIONAL			PPG ARCHITECTURAL FINISHES		
Type & Surface	Luster	Max VOC Content ² (g/L)	No. of Coats	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)
14. Interior Concrete Masonry Units Walls or Concrete Walls/Ceilings	Acrylic Latex Semi-Gloss	150	2	PrepRite Block Filler Int/Ext Latex (B25W25)	8.00	Y	SuperSpec HI Build Block Filler (206)	8.50	N	Concrete Coatings Block Filler Interior/Exterior (3010-1200)	10.00	Y	Speedhide 6-7 Int/Ext Latex Block Filler	7.40-8.00	Y
				ProMar 200 Zero VOC Semigloss (B31W2651)	1.60	Y	Aura Semi-Gloss Waterborne Interior Paint (0528)	1.50	Y	Ultra Hide No VOC Interior SemGloss Finish (1415)	1.30-1.50	Y	Speedhide 6-4510 Zero VOC Interior Latex Semi Gloss	1.30	Y
15. Interior Concrete Ceilings (Guestrooms)	Acrylic Latex Eggshell	100	1	Multi-Purpose Latex Primer/Sealer B51 Series (B25W25)	1.40	Y	Equivalent Product			Equivalent Product			Equivalent Product		
				ProMar 200 Zero VOC Semigloss (B31W2651)	1.00	Y	Aura Semi-Gloss Waterborne Interior Paint (0528)	1.50	Y	Ultra Hide No VOC Interior SemGloss Finish (1415)	1.30-1.50	Y	Speedhide 6-4510 Zero VOC Interior Latex Semi Gloss	1.30	Y
16. Not Used															
17. Interior Wood	Acrylic Latex Semi-Gloss	150	2	Self Priming- No Primer Required			Self Priming- No Primer Required			Gripper Multi-Purpose Interior/Exterior Water-Based Primer Sealer (3210-1200)	1.50	Y	SealGrip 17-921 Acrylic Universal Primer	1.60	Y
				Solo Acrylic Semigloss (A76W51)	1.50	Y	Aura Semi-Gloss Waterborne Interior Paint (0528)	1.50	Y	LifemasterOil Semi-Gloss Wall & Trim Enamel (1506)	1.50-2.00	Y	Speedhide 6-1510 Interior Alkyd WB Semi Gloss	1.80	Y

DESCRIPTION				MANUFACTURER															
Type & Surface	Luster	Max VOC Content ² (g/L)	No. of Coats	SHERWIN-WILLIAMS			BENJAMIN MOORE			GLIDDEN PROFESSIONAL			PPG ARCHITECTURAL FINISHES						
				Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)				
18a. Interior Wood	Natural Finish Satin Stain	250	1	Minwax 250 VOC Stains	Nominal	Y	250	Benwood Waterborne Interior Stain (205)	Nominal	N	231	Wood Pride Professional Wood Finishes Water-Based Wood Finishing Semi-Transparent Stain (1700V)	Nominal	Y	250	Olympic 44500 Low VOC Wood Stain	Nominal	Y	240
		350	2	Wood Classics Waterborne Polyurethane Varnish (A68 Series)	1.00		309	Benwood Stays Clear Acrylic Polyurethane Finish Low Luster (423)	1.10	N	270	Wood Pride Professional Finishes Water-Based Satin Varnish (1802)	1.00	Y	182	Olympic 42786 Urethane WB Varnish Satin	1.00	Y	<250
18b. Not Used																			

DESCRIPTION				MANUFACTURER												
Type & Surface	Luster	Max VOC Content ² (g/L)	No. of Coats	SHERWIN-WILLIAMS			BENJAMIN MOORE			GLIDDEN PROFESSIONAL			PPG ARCHITECTURAL FINISHES			
				Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	Products	Dry Mil Thickness (Per Coat)	GS-11 ¹ VOC ² (Y or N)	

Note 1. Paints, coatings and primers meet or exceed the VOC and chemical component limits of Green Seal Standard GS-11 (First Edition May 20, 1993) requirements.

Note 2. VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Clear wood finishes, floor coatings, stains, and shellacs do not exceed the VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113.

Architectural Coatings (in effect January 1, 2004). VOC Levels shown are unthinned without colorants, actual levels may vary based on colors used.

Note: 3. Revisions from last version are shown in **BOLD**.

ADDENDUM A 02/02/15

- SECTION 09 9300 -**STAINING AND TRANSPARENT FINISHING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and the application of wood finishes on the following substrates:
 - 1. Interior Substrates:
 - a. Interior finish carpentry.
 - b. Interior linear wood plank ceilings.
 - c. Dressed lumber (finish carpentry).
 - d. Custom color stains.
 - e. Custom Door wood veneer color stains.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 06 4013 "Exterior Architectural Woodwork" for wood soffits, trim to be finished under this Section.
- D. Section 06 2000.01 "Finish Carpentry (Courtyard)".
- E. Section 06 2000.02 "Finish Carpentry (Residence Inn)".
- F. Section 09 9113 "Exterior Painting" for standard paint systems on exterior substrates.
- G. Section 09 9123 "Interior Painting" for surface preparation and application of standard paint systems on interior substrates.
- H. Section 09 9123.01 "Interior Paint Schedule" for Paint Schedule for interior substrates.
- I. Section 09 9600 "High-Performance Coatings" for field applied high-performance coatings on concrete floors and exterior metal surfaces.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- D. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated, demonstrate compliance with specified attributes. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
 - 1. Architect will select from these options and approve color(s) prior to materials being ordered. Provide number of coats on sample as specified:
 - a. Wood components as indicated on Drawings.
 - 2. All material shall be prepared as required and shall be representative of finished installed work.
 - 3. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 - 1. Coatings Quantity: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied
 - a. Provide two copies of the mixing formula to the Architect in addition to the instructions attached to paint containers.
 - 2. Refer to Section 01 7843 "Spare Parts"

STAINING AND TRANSPARENT FINISHING

1.8 CLOSEOUT SUBMITTAL

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.
- C. At completion of Work of this Section, submit manufacturer's or distributor's numbered invoices showing type and quantity of products used on this Project.
- D. Coating Maintenance Manual: Upon conclusion of the project, the contractor and paint manufacturer/supplier for each paint manufacturer used shall furnish a Coating Maintenance Manual.
 - 1. Manual shall include the following.
 - a. Area Summary with Finish Schedule.
 - b. Area Detail designating where each product, color and finish was used.
 - c. Product Data pages.
 - d. Material Safety Data Sheets (MSDS).
 - e. Care and Cleaning instructions.
 - f. Touch-up procedures.
 - g. Color samples of each color and finish used.

1.9 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of stain color selections will be based on mockups.
 - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.11 PROJECT CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

- C. Do not apply exterior finishes in rain, fog, or mist.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Material Compatibility:
1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Provide Semi-Transparent Stain manufactured by Zinsser Brands/Rust-Oleum Corporation; tel: (732) 469—8100, web: www.zinsser.com , distributed by Dunn Edwards Paints.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the category indicated.

2.3 WOOD FILLERS

- A. Wood Filler Paste: MPI #91, or similar, compatible with the water repellent wood stain.
1. VOC Content: E Range of E2.
 2. Match color of wood species.
 3. Shop-applied products as recommended by staining manufacturer

2.4 STAINS

- A. Stain, Water-Based, Semi-Transparent, for Interior Wood :
1. OKON Weather Pro; OK-128
 2. Minwax® Wood Finish™
 3. ZENITH™ LWS0750 by Valspar
 4. Technical Properties:
 - a. VOC Content:
 - 1) Refer to Section 01 6116 "Volatile Organic Compound (VOC) Restrictions"
 - b. Generic Type: Modified Acrylic Emulsion.
 - c. Product Type: Water based.
 - d. Pigment Quantity: 1.2 percent minimum by weight.

STAINING AND TRANSPARENT FINISHING

- e. Volume Solids: **15 percent**, minimum by weight.
- f. Breathable: Yes, ASTM 1653
- g. Flash Point: N/A.

2.5 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- B. Maximum Moisture Content of Interior Wood Substrates: 13 percent, when measured with an electronic moisture meter.
- C. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, reinstall items that were removed; use workers skilled in the trades involved. Remove surface-applied protection if any.

- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Remove surface dirt, oil, or grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps exposed to view and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Exterior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
- E. Interior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
 - 3. Before priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - 4. Sand surfaces that will be exposed to view and dust off.
 - 5. Prime edges, ends, faces, undersides, and backsides of wood.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for finish and substrate indicated.
 - 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD FINISH SYSTEM SCHEDULE

- A. Wood substrates, nontraffic surfaces, elements identified on the Drawings, including wood trim, glued-laminated beams, exposed wood trusses, exposed linear ceiling planks, exposed timber beams and columns.
- B. Shop-Applied Finish:
 - 1. Semitransparent Stain System:
 - a. Prime Coat: Stain, water based, semi-transparent, matching topcoat.
 - b. Topcoat: Stain, water based, semi-transparent.
- C. Topcoat to be applied while prime coat is still damp, per manufactures written instructions. Apply top coat to all exposed edges and surfaces.
- D. Concealed surfaces to be marked prior to packaging and shipping prefinished lumber to the jobsite. Finishes to be fully cured prior to wrapping in protective packaging.
- E. Apply stain finishes to field cut surfaces to match adjacent finishes. Apply prime coat to filed cut edges not exposed to view.
 - 1. Do not attempt to refinish shop finished wood surfaces. Material will be rejected.

- END OF SECTION -

- SECTION 09 9600 -**HIGH PERFORMANCE COATINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems.
 - 1. Exterior Substrates:
 - a. Steel.
 - b. Galvanized metal.
 - c. Aluminum (not anodized or otherwise coated).
 - 2. Interior Substrates:
 - a. Pipe railings and gates.
 - b. Masonry, CMU
 - c. Steel.
 - d. Galvanized metal.
 - e. Epoxy floor finish (EF-2).
 - 3. Paint all exposed surfaces, whether or not colors are designated, except where a surface or material is indicated not to be painted or is to remain natural. Where an item or surface is not mentioned, paint the same color as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from colors or finishes available.
 - 4. Painting is not required on factory-finished items, operating parts, or labels.
 - a. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels, or equipment name, identification, performance rating, or nomenclature plates.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying sealants or referencing this Section for high performance coating products and Execution Requirements.
- B. Section 05 0810 "Galvanized Finishes on Steel".
- C. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.

- D. Division 09 Painting Sections for special-use coatings and general field painting.
- E. Section 09 6723 "Resinous Flooring" for "Epoxy" listed floor finishes (EF-1).
- F. Section 10 7316 "Custom Steel Canopies".

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 DEFINITIONS

- A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- B. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.6 ACTION SUBMITTALS

- A. Product Data: For each coating system indicated, demonstrate compliance with specified attributes. Include primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- B. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- C. Color Charts: In duplicate, for all paints, stains and special coatings. Identify with numbers used on the "Finish Index" on Drawings.
- D. Samples for Verification: Of each color and material to be applied, with texture to simulate actual condition, on representative samples of the actual substrate.
 - 1. Submit samples on the following substrates for Architect's review of color and texture:
 - a. Ferrous and Nonferrous Metal: Provide two 4-inch square samples of flat metal and two 8-inch long samples of solid metal for each color and finish.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 - 1. Coatings Quantity: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.
 - a. Provide two copies of the mixing formula to the Architect in addition to the instructions attached to paint containers.

1.8 CLOSEOUT SUBMITTAL

- A. Submit under provisions of Section 01 7700.
- B. Warranty: Submit specified warranty.
- C. At completion of Work of this Section, submit manufacturer's or distributor's numbered invoices showing type and quantity of products used on this Project.
- D. Coating Maintenance Manual: Upon conclusion of the project, the contractor and paint manufacturer/supplier for each paint manufacturer used shall furnish a Coating Maintenance Manual.
 - 1. Manual shall include the following.
 - a. Area Summary with Finish Schedule.
 - b. Area Detail designating where each product, color and finish was used.
 - c. Product Data pages.
 - d. Material Safety Data Sheets (MSDS).
 - e. Care and Cleaning instructions.
 - f. Touch-up procedures.
 - g. Color samples of each color and finish used.
 - 2. Manufacturers other than Sherwin Williams shall provide a manual which matches or exceeds the content of a "Custodian Project Color and Project Information Report" as provided by Sherwin Williams.

1.9 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Architectural Exposed Structural Steel (AESS) Surfaces: Provide field samples of at least 6 square feet, include surface edges.
 - b. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - c. Other Items: Architect will designate items or areas required.
 - d. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of **45 deg F**. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 1. Protect materials from freezing. Keep storage area neat and orderly.
 2. Remove rags and waste daily.
 3. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.11 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are within ranges recommended by manufacturers.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.
 1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

1.12 WARRANTY

- A. Provide a five-year material and labor warranty from the manufacturer and the applicator.

1.13 EXTRA MATERIAL

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Refer to Section 01 7843 "Spare Parts"

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- B. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.

2.2 COATINGS MATERIALS, GENERAL

- A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: As indicated or scheduled. If none are shown, then as selected by Architect from manufacturer's full range of available options.
- D. Paint-material containers not displaying manufacturer's product identification will **NOT** be acceptable.

2.3 EXTERIOR HIGH-PERFORMANCE COATINGS

- A. Basis of Design: Components specified in this Section are manufactured by **Tnemec** and is the standard of quality against which the architect will judge equivalency of materials.
 - 1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - a. Carboline Company.
 - b. Dudick, Inc.
 - c. Glidden Professional; Devoe Coatings.
 - d. Sherwin Williams
 - e. Tnemec.
 - f. Zinsser; Rustoleum.
- B. Detailed specifications for the various surfaces are shown in the Paint Schedule at the end of this Section.
 - 1. If these specifications conflict with the recommendations of the manufacturer, this discrepancy shall be brought to the attention of the Architect and Owner's Representative for review and clarification on what shall be followed.

2.4 ELASTOMERIC COATINGS

- A. Basis of Design: Components specified in this Article are manufactured by Dow and is the standard of quality against which the architect will judge equivalency of materials.
 - 1. Manufacturer: Subject to compliance with requirements, provide the following:
 - a. Dow Company, Product All-Guard.
 - 1) One-part, 100 percent water-based silicone elastomeric coating.
 - b. Substitutions: Section 01 2500.

2.5 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

2.6 MATERIAL, EPOXY FLOOR FINISH

- A. MANUFACTURERS
1. Dur-A-Flex, Inc. (800-253-3539)
- B. Decorative Epoxy Coating for Concrete Floors:
1. Preparation:
 - a. Prepare surface as recommended by manufacturer.
 - 1) Use abrasive blast cleaning method if requested.
 2. Two Part Epoxy Coating
 3. Color: Refer to Drawings.
 4. Model: Refer to Drawings
 5. Finish: Refer to Drawings

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
- B. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Masonry (Clay and CMU): 12 percent.
 - c. Wood: 15 percent.
 - d. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

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- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi (10 350 to 27 580 kPa) at 6 -inches to 12 -inches (150 to 300 mm).
 - 2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- H. Aluminum Substrates: Remove loose surface oxidation.
- I. Galvanized Substrates: Shall be sanded to profile prior to intermediate coat.
- J. If necessary, insert requirements for preparing wood substrates from the ARCOM master.

- K. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.
 - 1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi (690 to 4140 kPa) and/or 1500 to 4000 psi (10 350 to 27 580 kPa) at 6 -inches to 12 -inches (150 to 300 mm) to properly treat and prepare substrate for finishing.

3.3 APPLICATION

- A. Apply finish systems to substrates indicated in dry mil thicknesses as scheduled
- B. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 3. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- D. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- E. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. **Concrete Substrates**, Vertical Surfaces and locations indicated on drawings:

1. Elastomeric Coating: One-part, 100 percent water-based silicone elastomeric coating.
 - a. Primer Coat: Primer, as recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: Elastomeric, high-build, matte gloss, (5.0 mils).
 - 1) Dow All-Guard.
 - 2) Carboline, Flexxide Elastomer
 - c. Final Coats: Elastomeric, high-build, matte gloss, (5.0 mils).
 - 1) Dow All-Guard.
 - 2) Carboline, Flexxide Elastomer

B. **Steel Substrates:**

1. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Primer Coat: Primer, epoxy, as recommended in writing by topcoat manufacturer, (5.0 mils).
 - 1) CARBOLINE Carboguard 890 Series
 - 2) Tnemec Hi-Build Epoxoline II Series L69
 - 3) Sherwin Williams Macropoxy 646-100
 - b. Intermediate Coat: Epoxy, high-build, low gloss, (5.0 mils).
 - 1) CARBOLINE Carboguard 890 Series
 - 2) Tnemec Hi-Build Epoxoline II Series L69
 - 3) Sherwin Williams Macropoxy 646-100
 - c. Final Coats: Polyurethane, two-component, pigmented, gloss (Gloss Level 6) (2.5 mils)
 - 1) CARBOLINE CARBOTHANE 134 SERIES.
 - 2) Tnemec Endura-Shield Series 1095.
 - 3) Sherwin Williams WB Acrolon 100 Series B65.

C. Galvanized Substrates:

1. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Primer Coat: Primer, epoxy, as recommended in writing by topcoat manufacturer, (5.0 mils).
 - 1) CARBOLINE CARBOMASTIC EPOXY 15
 - 2) Tnemec Hi-Build Epoxoline II Series L69
 - 3) Sherwin Williams Macropoxy 646-100
 - b. Intermediate Coat: Epoxy, high-build, low gloss, (5.0 mils).
 - 1) CARBOLINE Carboguard 890 Series
 - 2) Tnemec Hi-Build Epoxoline II Series L69
 - 3) Sherwin Williams Macropoxy 646-100
 - c. Final Coats: Polyurethane, two-component, pigmented, gloss (Gloss Level 6) (2.5 mils)
 - 1) CARBOLINE CARBOTHANE 134 SERIES.
 - 2) Tnemec Endura-Shield Series 1095
 - 3) Sherwin Williams WB Acrolon 100 Series B65.

D. Concrete Masonry (CMU) Substrates:

1. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Primer Coat: Primer, epoxy, as recommended in writing by topcoat manufacturer, (5.0 mils to 15mils).
 - 1) CARBOLINE Santile 600 Block Filler
 - 2) Tnemec, Series 130 (Block Filler)
 - 3) Sherwin Williams, Cement Plex 875 B42
 - b. Intermediate Coat: Epoxy, high-build, low gloss, (5.0 mils).
 - 1) CARBOLINE Carboguard 890
 - 2) Tnemec, L69F
 - 3) Sherwin Williams, Macropoxy 646-100
 - c. Final Coats: Polyurethane, two-component, pigmented, gloss (Gloss Level 6) (2.5 mils)
 - 1) Tnemec, 1095
 - 2) Sherwin Williams, WB Acrolon 100 Series B65.
 - 3) CARBOLINE, Carbothane 134 VOC

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates:
 - 1. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Refer to EXTERIOER SCHEDULE, Article 3.6
- B. Galvanized Substrates:
 - 1. Pigmented Polyurethane over High-Build Epoxy System:
 - a. Refer to EXTERIOER SCHEDULE, Article 3.6
- C. Steel, factory primed Metal Substrate:
 - 1. Two coat high-solids polyamide epoxy coating system
 - a. Primer Coat: Shop Primer, by wall panel manufacturer.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, (5.0 mils)
 - 1) Tnemec Hi-Build Epoxoline II Series L69
 - c. Final Coats: Waterborne Acrylic Polyurethane, two-component, pigmented, semi-gloss (Gloss Level 5), (2.5 mils).
 - 1) Tnemec UVX Series 750.

- END OF SECTION -

- SECTION 09 9623 -**GRAFFITI RESISTANT COATINGS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and penetrating non-sacrificial graffiti resistant coatings for the following vertical and horizontal surfaces:
 - 1. As indicated on Drawings.
 - 2. Exterior Insulation Finish System (EIFS).

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 8113 "Sustainable Design Requirements".
- C. Section 01 4339 "Mockup Requirements" for mockups.
- D. Section 01 4553 "Façade Mockup Testing" for mockup of exterior ground level concrete wall treatment.
- E. Section 07 9213 "Exterior Façade Joint Sealants" to be installed and fully cured prior to installation of the material specified in this Section.
- F. Section 07 2419 "Exterior Insulation and Finish System" for surface treatment on special finish coat.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.

- B. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- C. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- D. Samples for Verification: For each material to be applied, on representative samples of the actual substrate.
 - 1. Provide samples in addition to site mockups.
 - 2. Provide stepped Samples defining each separate coat. Resubmit until required sheen is achieved.
 - 3. List of material and application for each coat of each sample. Label each sample for location and application.
 - 4. Submit samples on the following substrates for Architect's review of shade and sheen:
 - a. Quantity: (4) four of each substrate
 - b. Size:
 - 1) EIFS: 12 -inches (100-mm-) square.

1.6 INFORMATIONAL SUBMITTALS:

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience.
 - 1. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Product Certificates: For each type of water repellent, from manufacturer.
- C. Preconstruction Testing Reports: For water-repellent-treated substrates.
- D. Field quality-control reports.
- E. Warranty: Special warranty specified in this Section.
 - 1. Submit copies of manufacturer's required documentation that installer submitted to manufacturer.

1.7 DEFINITIONS

- A. RILEM: International Union of Testing and Research Laboratories for Materials and Structures located in Paris, France. (Reunion Internationale des Laboratoires d'Essais et de Recherches sur les Materiaux et des Constructions.)
 - 1. Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.

- B. RILEM tube: Manufacturers committee, Commission 25-PEM developed a method to assess deterioration of natural building stone utilizing what has become known as a RILEM tube.

1. These tubes are now commonly used to evaluate water absorption rates on many new, existing, man-made and naturally occurring building materials.

1.8 MOCKUPS

- A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each substrate required. Duplicate finish of approved sample Submittals.

1. Contractor shall build a separate site mockup panel of each different substrate to represent surfaces and conditions for application.
 - a. Size: At least 4 –square feet or as directed by Architect, of wall surface for each different substrate.
 - b. A separate mockup shall be required Interior Thin Brick veneer.
2. If approved by Architect, Architect shall select one area or building façade surface of each different substrate to represent surfaces and conditions for application.
 - a. Size: At least 4 –square feet or as directed by Architect, of wall surface for each different substrate.
3. Apply coatings to each surface as specified.
 - a. After finishes are accepted, Architect will use the surface to evaluate coating systems of a similar nature.
4. Final approval of coatings will form and establish benchmark samples.

1.9 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination."

1.10 PROJECT CONDITIONS

- A. Surface Preparation: Contractor or applicator shall be responsible for providing a clean, dry substrate free from oil, dirt, grease, efflorescence or any other coating which may inhibit penetration and adhesion of Graffiti resistant coating. This requirement applies to new construction, renovation or remedial projects. Substrate must be completely dry prior to applying product.
- B. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
1. Ambient temperature is between 45 deg F (7.2 deg C) and 105 deg F (40.6 deg C), 90 percent relative humidity and will remain so for 24 hours.
 2. Morning dew is not predicted within 24 hours.
 3. Rain is not predicted within 24 hours.
 4. Not less than 48 hours have passed since surfaces were last wet.
 - a. Surface must be completely dry.
 5. Windy conditions do not exist that might cause Graffiti-resistant coating to be blown onto vegetation or surfaces not intended to be treated.
 6. Building has been closed in for not less than 30 days before treating wall assemblies.

7. Concrete surfaces and mortar have cured for not less than 28 days.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01 6000 "Product Requirements".
- B. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
 1. Name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for vehicle constituents.
 5. Application instructions.
 6. Handling instructions and precautions.
- C. Store materials not in use in tightly covered containers in a well-ventilated area at a temperature range between **50 deg F** and **85 deg F**. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 1. Protect materials from freezing.
 2. Keep storage area neat and orderly.
 3. Remove oily rags and waste daily.
 4. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.12 WARRANTY

- A. Comply with provisions of Section 01 7700 "Closeout Procedures".
- B. Special Warranty: Manufacturer's standard form in which manufacturer, Applicator and contractor agree(s) to repair or replace any material that is proven to be defective, provided it has been applied according to the manufacturer's instructions and guidelines.
 1. Product Names: Concrete Coat anti-graffiti coatings:
 - a. Warranty Period: Ten (10) years.
 - b. Warranty shall include all products necessary for reapplication, in like quantities.
 - c. Product replacement:
 - 1) **100 percent** of full value for the first three (3) years of warranty period
 - 2) Prorated for the remaining seven (7) years after initial three (3) years.
 - d. Manufacturer's warranty excludes wear and tear of product, only manufacture defects.
 - e. Manufacturer's warranty excludes responsibility for any other damages resulting from defective material.

1.13 EXTRA MATERIAL

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Refer to Section 01 7843 "Spare Parts"

GRAFFITI RESISTANT COATINGS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.
- C. Graffiti Resistant Coating: Comply with performance requirements specified, as determined by preconstruction testing on substrate assemblies representing those indicated for this Project.

2.2 MANUFACTURERS

- A. Basis of Design: Products as specified and manufactured by Coval Molecular Coatings, Petaluma, CA; tel: (707) 242-6900; web: www.covalmolecular.com, Local Distributor/Representative: Jon Miller, Quantum Coatings; tel: (877) 586-1966; web: www.quantum-coatings.com.
 - 1. Substitutions: Section 01 2500.
 - a. Proposed substitution products must be equal in terms of composition, performance standards, and coating thickness.

2.3 COATINGS MATERIALS, GENERAL

- A. Anti-Graffiti coatings comprised of nano-sized quartz particles covalently bonded to substrates to eliminate all molecular voids in coating and form a non-sacrificial barrier of protection.
- B. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.4 PENETRATING GRAFFITI RESISTANT COATING SYSTEMS

- A. General:
 - 1. Type: Clear protective coating
- B. Product: Concrete Coat:
 - 1. Application:
 - a. EIFS
 - 2. Vehicle Type: Solvent base.
 - 3. Finish: as selected by Architect from
 - a. Gloss
 - b. Satin

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements.
 - a. Check moisture content in three representative locations by method recommended by manufacturer.
 - 2. Inspect for previously applied treatments that may inhibit penetration or performance of coatings.
 - 3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of coating.
 - 4. Verify that required repairs are complete, cured, and dry before applying coatings.
 - 5. Verify that joint sealant work in adjoining surfaces is complete.
 - a. Delay application until sealants have cured.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Prepare surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, release agents, silicone and polymer coatings.
 - a. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces if recommended by coating manufacturer and approved by Architect during Mockup process.
 - b. Roughen as required to remove glaze if recommended by coating manufacturer and approved by Architect during Mockup process.
 - 1) Do not proceed on EIFS unless approved in writing by EIFS finish manufacturer and Architect.
 - c. Use abrasive blast-cleaning methods if recommended by coating manufacturer and approved by Architect during Mockup process.
 - 1) Do not proceed on EIFS unless approved in writing by EIFS finish manufacturer and Architect.
 - d. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - 2. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- B. Pre-sealing is required on any porous substrate per the manufacturer's written instructions.
- C. Material Preparation: Carefully prepare coating materials according to manufacturer's written instructions.
 - 1. Maintain containers and applying coatings in a clean condition, free of foreign materials and residue.

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- D. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of coating system components. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of components being deposited on surfaces. Cover live plants and grass.
- E. Coordination with Sealants: Do not apply Graffiti resistant coatings until sealants for joints adjacent to surfaces receiving coatings have been installed and cured.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 APPLICATION

- A. General: Apply Anti-Graffiti resistant coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques best suited for the material being applied.
 - 2. Give special attention to edges, corners, crevices, and similar surfaces to ensure that they receive a wet film thickness equivalent to that of flat surfaces.
- B. Scheduling Coating: Apply coating to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
- C. Maximum Coating Thickness: Apply each material no thicker than manufacturer's recommended spreading rate.
 - 1. Product: Concrete Coat:
 - a. Wet Mils: 2.5 to 3.5.
 - b. Dry Mils: 1.5 to 2.1.
- D. Completed Work: Match approved Samples for sheen and coverage.
 - 1. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 CLEANING

- A. Immediately clean Anti-Graffiti resistant coatings from adjoining surfaces and surfaces soiled or damaged by application as work progresses. Repair damage caused by application.
 - 1. Comply with manufacturer's written cleaning instructions.

3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
 - 1. Provide "Wet Paint" signs to protect newly coated finishes.
 - a. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
 - 2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 SCHEDULE

- A. Apply at all exterior exposed portland cement plaster, EIFS, unpainted masonry units, metal and signage. Material to be applied directly to painted and unpainted building material as recommended by manufacturer.
- B. Provide Anti-Graffiti coating systems over the following vertical and horizontal surfaces; and where otherwise indicated on Drawings:
 - 1. Surfaces as specified:
 - a. Where indicated on Drawings.
 - b. Building exterior EIFS elements up to second level finish floor level.

- END OF SECTION -

- SECTION 09 9628 -**HIGH PERFORMANCE ACRYLIC FINISHES FOR
INDOOR POOLS**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes high performance interior acrylic finish system assembly over gypsum board installation including joint treatment and surface preparation and application at following locations;
1. Interior walls and ceilings for;
 - a. As specified in Schedule
 - b. As indicated on Drawings
 2. Sealing with sealant at base of wall sheathing at transition to floor prior to coating application.
 3. Sealing with paintable sealant around all non-rated wall openings such as J-Boxes.
 4. Sealing with paintable sealant around all rated wall openings such as J-Boxes which does not interfere with fire rated opening protection installed by others.
 5. Acrylic coating is not required on factory-finished items, operating parts, cabinets, light fixtures or labels.
 - a. Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels, or equipment name, identification, performance rating, or nomenclature plates.
 6. Coordinate with air barrier / waterproof membrane being installed over the wall sheathing for the tile finish in the Indoor Pool room.
- B. Associated work provided and installed under other specification scope shall include, but not be limited to;
1. Substrates other than those indicated and specified to receive High Performance Acrylic Finish shall be painted in accordance with;
 - a. Section 09 9600 "High Performance Coatings"
 2. Finish flooring.
 3. Fire penetration sealing around/behind all wall J-Boxes at fire rated walls and ceilings, refer to Section 07 8413 "Penetration Firestopping"

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 01 8113 "Sustainable Design Requirements".
- D. Pertinent Sections specifying sealants or referencing this Section for High Humidity Texture Acrylic Coating products and Execution Requirements.
- E. Section 07 9200 "Joint Sealants"
- F. Section 07 8413 "Penetration Firestopping" for Putty Pads or Box inserts installed around all wall and ceiling boxes at fire rated conditions.
- G. Division 8 for doors and windows.
- H. Section 09 2216 "Non-Structural Metal Framing" for interior wall framing by others.
- I. Section 09 2226 "Gypsum Board Ceiling Suspension Systems" for interior ceiling framing by others.
- J. Section 09 2900 "Gypsum Board" for gypsum sheathing installation to receive finish system as specified.
- K. Section 09 3013 "Tiling" for liquid applied Air Barrier / Waterproof membrane being installed over the wall sheathing at the Indoor Pool room.
- L. Section 09 8100 "Acoustic Insulation" for wall and ceiling insulation.
- M. Section 09 9600 "High Performance Coatings" for priming and painted of surfaces other than those to receive finish as herein specified.
- N. Division 09 Sections for flooring.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.
- B. ANSI FM 4880 Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies; Plastic Interior Finish Materials; Plastic Exterior Building Panels; Wall/Ceiling Coating Systems; Interior or Exterior Finish Systems
- C. [ASTM International \(ASTM\)](#) Publications:
 - 1. ASTM C 36 "Standard Specification for Gypsum Wallboard".
 - 2. ASTM C 150 Specification for Portland Cement
 - 3. ASTM C 297 Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane
 - 4. ASTM D 522 Test Methods for Mandrel Bend Test of Attached Organic Finishes

5. ASTM D 968 (Federal Test Standard 141A Method 6191) Test Method for Abrasion Resistance of Organic Finishes by Falling Abrasive
 6. ASTM D 3273: Test Method for Resistance to Growth of Mold on Surfaces
 7. ASTM D 4060 Standard Test Method for Abrasion Resistance of Organic Finishes by the Taber Abraser
 8. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
 9. ASTM E 96 Test Methods for Water Vapor Transmission of Materials
- D. Barcoll Hardness Index measured by Barcol-Impressor device manufactured by Barber-Colman, www.barcol-impressor.com
- E. Dryvit product and application Publications:
1. DS152 Cleaning and Recoating.
 2. DS159 Dryvit Water Vapor Transmission Data Sheet
 3. DS498 dryvitCARE™ EIFS Repair Procedures.
 4. DS561 Dryvit Architectural Finishes For Indoor Pool Areas, Specifications
- F. Installation and finishing of gypsum board, refer to Section 09 2900 "Gypsum Board" and as herein specified.
- G. Mil Std E5272 Environmental Testing
- H. Mil Std 810B Environmental Test Methods
- I. NFPA 268 Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
- J. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
- K. UPITT LC50 for thermal toxicity, "Standard Reference Material for Calibration of the University of Pittsburgh Smoke Toxicity Method for Assessing the Acute Inhalation Toxicity of Combustion Products".
- L. Technology International Group, EU construction products certification EN15824 (CE Mark), www.techintl.com

1.5 DEFINITIONS

- A. Contractor: The contractor that applies materials to the substrate.
- B. Dryvit: Dryvit Systems, Inc., the manufacturer of the coating materials, a Rhode Island corporation.
- C. Lamina: The layer consisting of the reinforced base coat and finish materials.
- D. Finish: An acrylic based coating, available in a variety of textures and colors, which is applied to the prepared wall surface.

- E. Reinforced Base Coat: The layer consisting of fiberglass reinforcing mesh fully embedded in the base coat material applied to the outside surface of the sheathing.
- F. Reinforcing Mesh: Glass fiber mesh used to reinforce the base coat and to provide impact resistance.
- G. Sheathing: A specific approved substrate in sheet form.
- H. Substrate: The material to which the Dryvit finishes are applied.

1.6 ACTION SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Product Data: For each High Performance Acrylic Finishes for Indoor Pool component indicated or specified, demonstrate compliance with specified attributes.
 - 1. Material List: An inclusive list of required gypsum sheathing, plastic transition components, joint treatments, primer and coating materials.
 - a. Indicate each material and application.
 - b. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying and installing each material specified.
- C. Test data shall be submitted in printed form from the manufacturer's standard printed material;
- D. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- E. Submit coating manufacturer's technical information including installation instructions for joint compounds and coatings.
- F. Samples for Verification: 24-inch (600-mm-) square panels for of each color and material to be applied, with texture to simulate actual condition, on representative samples of the actual substrate.
 - 1. Submit (3) three samples on the selected color(s) and texture(s) for Architect's review.
 - a. Provide for each sample a listing of materials and the application for each coat of material.
 - b. Sample shall include a least one finished joint between gypsum board pieces incorporating fiberglass tape and joint compound as specified...
- G. Mockups: See QUALITY ASSURANCE article

1.7 INFORMATIONAL SUBMITTALS

- A. VOC Submittals:
 - 1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
- B. Qualification Data: For Installer and testing agency.

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- C. Manufacturer Certificates: Signed by manufacturers certifying that finish system complies with requirements.
- D. Material or Product Certificates: For cementitious materials and aggregates and for each insulation and joint sealant, from manufacturer.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each base coating, reinforcing mesh, primer, and acrylic finish coating.
- F. Material Safety Data Sheets (MSDS): For storage on site.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For High Performance Acrylic Finish to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Shall be Dryvit Systems, Inc. All materials shall be manufactured or sold by Dryvit and shall be purchased from Dryvit or its authorized distributor.
 - 1. Materials shall be manufactured at a facility covered by a current ISO 9001:2008 and ISO 14001:2004 certification. (More current date if applicable)
 - a. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
- B. Applicator Qualifications: Engage an experienced applicator who has completed same coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
 - 1. Applicator shall have attended an authorized "Product Material Application Training" session provided by Dryvit.
 - 2. All bidding applicators should have attended a factory product application session and otherwise be qualified to apply materials prior to submitting bid.
 - a. Applicator shall submit a photocopy of factory certificate as proof of attendance at factory training session with the bid.
- C. Source Limitations: Obtain base coat, primers, reinforcing mesh and finish coating materials for coating system from the same manufacturer.
- D. Compatibility: Provide primers and other substrate preparation materials that are produced or are specifically recommended by the same manufacturer as the finish materials to insure compatibility of the system.
 - 1. Use thinners approved by the coating manufacturer, and use only within recommended limits.
 - 2. Coating manufacturer shall be a ISO 9001 and ISO 14001 manufacturing facility
- E. Skilled Workmanship
 - 1. All work shall be done by skilled mechanics in accordance with the best standard practice in the industry.
 - 2. Work shall be uniform in appearance, free of visual defects, and complete.
- F. Coordination of Work

1. Review other sections of these specifications in which prime paints, raw substrates, or other substances might be present to insure compatibility of total coatings systems.
 2. Upon request from other trades, furnish information or characteristics of coating materials provided for use to insure compatible substrate materials and finishes are used.
- G. Mockups: Apply benchmark samples of each coating system with color(s) and texture(s) on all applicable substrates indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent typical surfaces and conditions for application of each type of coating on all applicable substrates.
 - a. Provide samples of at least **30 square feet**.
 - b. Contractor shall also create or cause to be created temporary or permanent lighting which accurately reproduces finished-project lighting conditions for the purpose of viewing above samples.
 - 1) Work on the balance of the areas to be coated shall commence after Contractor has received written approval of the installed jobsite samples from Architect.
 2. Coordination Mockup: Architect will select one additional surface to represent ceiling to wall transition at Indoor Pool to address the Air Barrier installed over sheathing per this section and the Air Barrier / Waterproof membrane installed at wall for Tile finish per Section 09 9013.
 - a. Provide sample of at least **25 square feet** each plane at wall to ceiling transition.
 - b. Mockup shall include;
 - 1) 1st. Overlapping Air Barrier at ceiling (Genesis DM) with Air Barrier / Waterproof membrane installed at the wall of Indoor Pool room onto the ceiling by **6 -inches**
 - a) Refer to Section 09 **3013** for air barrier / waterproof membrane.
 - 2) 2nd. Part of mockup shall include installing Dryvit finish coat, PMR finish over Genesis and the Air Barrier / Waterproof membrane which overlapped on onto the Genesis base coat on half of the 1st. part of the mockup.
 3. Final approval of compatibility of Air Barrier and Waterproof membrane shall be made by contractor and installing contractors for each product.
 4. Final approval of color and texture will be based on benchmark samples.
 - a. If preliminary color and texture selections are not approved, apply additional benchmark samples of additional color and textures selected by Architect at no added cost to Owner.
 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion and approved by Architect.
- H. Preinstallation Conference: Conduct conference at Project site.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. All Dryvit materials shall be delivered to the job site in the original, unopened packages with labels intact.

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- B. Deliver materials to Project site in manufacturer's original, new and unopened packages, containers and on pallets for gypsum board and trim accessories bearing manufacturer's name and label with the following information as applicable:
 - 1. Product Name or Title of Material
 - 2. Product Description
 - 3. Manufacturer's Stock Number and Date of Manufacture
 - 4. Contents by Volume, for Pigment and Vehicle Constituents
 - 5. Application Instructions
 - 6. Color Name and Number
 - 7. VOC Content
- C. Upon arrival, materials shall be inspected for physical damage, freezing, or overheating.
 - 1. Questionable materials shall not be used.
- D. Materials shall be stored at the job site in a cool, dry location, out of direct sunlight, protected from weather and other damage in tightly covered containers, original packaging and on pallets in a well-ventilated area.
 - 1. Minimum storage temperature shall be as specified.
 - 2. Keep materials stored in an orderly and organized manner to reduce the risk of error.
 - 3. Do not stack materials more than three (3) containers high.
 - 4. Protect from fire hazards.
 - 5. Keep storage area neat and orderly.
 - 6. Remove rags and waste daily.
- E. Store gypsum board materials in accordance with gypsum board specification Section 09 2900.
- F. Store plastic joint and trim components to be installed with gypsum board in accordance with those manufacturers requirements.

1.11 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are within ranges recommended by manufacturers.
- B. At the time of application, the air and wall surface temperatures shall be minimum;
 - 1. 45 °F (7 °C) for Color Prime
 - 2. 40 °F (4 °C) for all other products.
 - 3. These temperatures shall be maintained, with adequate air circulation, for a minimum of 24 hours thereafter, or until the products are dry.
 - 4. If conditions cause rapid drying of the materials before proper finishes can be completed, eliminate breezes, fans or other air movements which contribute to the problem, and, if necessary, dampen the substrate with finely misted water just prior to application.
- C. Protect finishes from casual impact and rain for a period of (48) forty-eight hours after installation.
 - 1. Protect from heavy traffic for a period of at least three days.
 - 2. Protect all surfaces and adjacent areas not intended to be coated and clean immediately any spillage, droppings, or other extraneous contact of the materials with other surfaces.

1.12 COORDINATION

- A. Coordinate installation of acrylic finish system with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather-resistant sheathing paper, flashing, trim, joint sealants, windows, doors and other wall penetrations such as J-boxes are protected against damage from the effects of weather, age, corrosion, moisture, and other causes.
- B. Provide continuous operation to provide installation free of cold joints, scaffold lines, texture variations and other unacceptable finish defects.
- C. Coordinate the sequence of installing the air barrier product under this specification with the waterproof liquid applied membrane being installed under the tile specification regarding which materials overlap onto the other material on the gypsum board at the wall to ceiling transitions.

1.13 SEQUENCING AND SCHEDULING

- A. Installation of the Dryvit Architectural Finishes shall be coordinated with other construction trades.
- B. Sufficient manpower and equipment shall be employed to ensure a continuous operation, free of cold joints, scaffold lines, texture variations, etc.
- C. Installation of Air Barrier and finish coats and installation of waterproof membrane on walls under Tile specification section.

1.14 MAINTENANCE

- A. Maintenance and repair shall follow the procedures noted in Dryvit publication, DS498.
- B. All Dryvit products are designed to minimize maintenance.
 - 1. However, as with all building products, depending on location, some cleaning may be required.
 - a. See Dryvit publication DS152 on Cleaning and Recoating.

1.15 WARRANTY

- A. General contractor shall provide their standard warranty in accordance with project requirements for a period not less than (12) twelve months unless required to be longer as indicated in Division one.
- B. Applicator shall provide the following labor and material warranty;
 - 1. Material & Labor Warranty-coating integrity for (10) ten years from date of Substantial Completion.
 - 2. Mold & Mildew Material Warranty for (10) ten years from date of Substantial Completion.
- C. Finish coating manufacturer shall provide the following material warranty;
 - 1. Coating integrity for ten (10) years from date of Substantial Completion that product will not peel, crack or chalk.
 - 2. Mold & Mildew Material Warranty for ten (10) years from date of Substantial Completion that mold nor mildew will grow on the surface.

1.16 EXTRA MATERIAL

- A. Furnish extra High Performance Acrylic Finish material from the same production run that match products installed. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 - 1. Refer to Section 01 7843 "Spare Parts"
 - 2. Provide two copies of the mixing formula to the Architect in addition to the instructions attached to coating containers.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings:
 - 1. Comply with limits specified in Section 01 6116.
- C. Listing of a product in these specifications shall not be construed as a solicitation or requirement to use any product or combination of products in violation of the requirements of agency having jurisdiction.
 - 1. If a listed product does not meet the requirements of this rule, request approval for use of an alternate product by the same or another manufacturer meeting the requirements of this rule.
 - 2. Do not use products which do not meet the requirements of this rule.
- D. Gypsum sheathing:
 - 1. Refer to Section 09 2900 "Gypsum Board"
- E. Finish Coatings:
 - 1. Standardized Tests:
 - a. Flame Spread: ASTM E 84 less than 25,
 - b. Smoke Developed: ASTM E 84 less than 250
 - c. Flexibility: ASTM D 522 Method B: Passed 1.5 diameter @73 °F
 - d. Taber Abrasion: ASTM D 4060: 1000 cycles; 83 mg mass loss
 - 2. Abrasion Resistance: ASTM D 968 – 500 liters
 - 3. Mildew Resistance:
 - a. ASTM D 3273 – 28 days
 - 1) No visible mildew after incubation for ninety days (90) in 95 degrees F band 90 percent relative humidity under high contamination conditions.

F. The High Performance Acrylic Finish system shall have been tested as follows:

1. Durability:

TEST	TEST METHOD	CRITERIA	RESULTS
Abrasion Resistance	ASTM D 968	No deleterious effects after 500 liters (528 quarts)	No deleterious effects after 1000 liters (1056 quarts)
Accelerated Weathering	ASTM G 155 Cycle 1	No deleterious effects after 2000 hours	No deleterious effects after 5000 hours
	ASTM G 154 Cycle 1 (QUV)		No deleterious effects after 5000 hours
Freeze-Thaw	ASTM E 2485 (formerly EIMA 101.01)	No deleterious effects after 60 cycles	Passed – No deleterious effects after 90 cycles
	ASTM C 67 modified	No deleterious effects after 60 cycles	Passed – No deleterious effects after 60 cycles
	ASTM E 2485/ICC-ES Proc.; ICC ES (AC235)***	No deleterious effects after 10 cycles	Passed – No deleterious effects after 10 cycles
Mildew Resistance	ASTM D 3273	No growth during 28 day exposure period	No growth during 60 day exposure period
Water Resistance	ASTM D 2247	No deleterious effects after 14 days exposure	No deleterious effects after 42 days exposure
Taber Abrasion	ASTM D 4060	N/A	Passed 1000 cycles
Salt Spray Resistance	ASTM B 117	No deleterious effects after 300 hours exposure	No deleterious effects after 1000 hours exposure
Water Penetration	ASTM E 331 ICC ES (AC 235)***	No water penetration beyond the inner-most plane of the wall after 15 minutes at 137 Pa (2.86 psf)	Passed 15 minutes at 137 Pa (2.86 psf)
Water Vapor Transmission	ASTM E 96 Procedure B	Vapor permeable	EPS 5 perm-inch Base Coat* 40 Perms Finish** 40 Perms
Drainage Efficiency	ASTM E 2273 ICC ES (AC219) ICC ES (AC235)***	Minimum Drainage Efficiency of 90%	Passed
*Base Coat perm value based on Dryvit Genesis® ** Finish perm value based on Dryvit Quarzputz® *** AC 235 – Acceptance Criteria			

2. Structural:

TEST	TEST METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297/E 2134 ICC ES (AC 212)	Minimum 104 kPa (15 psi) – substrate or insulation failure	Minimum 213.6 kPa (31 psi)

3. Impact Resistance: In accordance with ASTM E 2486 (formerly EIMA Standard 101.86).

Reinforcing Mesh ¹ /Weight g/m ² (oz/yd ²)	Minimum Tensile Strengths	EIMA Impact Classification	EIMA Impact Range Joules (in-lbs)		Impact Test Results Joules (in- lbs)	
Standard - 146 (4.3)	27 g/cm (150 lbs/in)	Standard	3-6	(25-49)	4	(36)
Standard Plus TM - 203 (6)	36 g/cm (200 lbs/in)	Medium	6-10	(50-89)	6	(56)
Intermediate® - 407 (12)	54 g/cm (300 lbs/in)	High	10- 17	(90-150)	12	(108)
Panzer® 15 * - 509 (15)	71 g/cm (400 lbs/in)	Ultra High	>17	(>150)	18	(162)
Panzer 20 * - 695 (20.5)	98 g/cm (550 lbs/in)	Ultra High	>17	(>150)	40	(352)
Detail® Short Rolls - 146 (4.3)	27 g/cm (150 lbs/in)	n/a	n/a	n/a	n/a	n/a
Corner Mesh TM - 244 (7.2)	49 g/cm (274 lbs/in)	n/a	n/a	n/a	n/a	n/a
*Shall be used in conjunction with Standard Mesh (recommended for areas exposed to high traffic)						
1. It shall be colored blue and bear the Dryvit logo for product identification.						

4. Fire performance

TEST	TEST METHOD	CRITERIA	RESULTS
Fire Resistance	ASTM E 119	No effect on the fire resistance of a rated wall assembly	Passed 1 hour
Ignitability	NFPA 268	No ignition at 12.5 kw/m ² at 20 minutes	Passed
* Dryvit FM products must be specified			

5. The High Performance Acrylic Finish system shall have been tested as follows:

a. Surface Burning

TEST	TEST METHOD	CRITERIA	RESULTS
Surface Burning Characteristics	ASTM E 84	All components shall have a: Flame Spread \leq 25 Smoke Developed \leq 450	Passed

b. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Reinforcing Mesh Alkali Resistance of Reinforcing Mesh	ASTM E 2098 (formerly EIMA 105.01)	> 21dN/cm (120 pli) retained tensile strength after exposure	Passed

2.2 DESCRIPTION OF SYSTEM, GENERAL

- A. General: Architectural Finishes for Indoor Pool Areas consists of base coat and reinforcing mesh, acrylic primer and finish, applied to interior wall and ceiling surfaces.
- B. Assembly under this specification shall include the installation and finishing of the following:
 - 1. Substrate:
 - a. Gypsum sheathing provided and installed as specified.
 - 1) Refer also to Section 09 2900 Gypsum Board.
 - b. Inside and outside corner treatment of gypsum sheathing.
 - c. Joint treatment of gypsum board sheathing.
 - 2. Base coat installed over substrate.
 - 3. Reinforcing mesh installed with base coat.
 - 4. Primer installed over substrate as required by finish manufacturer for selected finish.
 - 5. Finish system finish applied over prepared substrates.

2.3 GYPSUM SHEATHING – MATERIAL AND FASTENERS

- 1. Basis of Design: Shall be DensShield Tile Backer as manufactured by Georgia Pacific Gypsum LLC, www.gp.com, available products that may be incorporated into the Work include the following:
 - a. CertainTeed Corp.; GlasRoc Diamond BackTile Backer (EGRG®).
 - b. National Gypsum., Gold Bond® e²XP™ Tile Backer.
- B. Composition:
 - 1. Glass-Mat, Water-Resistant Glass faced Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
- C. Performance:
 - 1. Thickness: 5/8 -inch (15.9 mm),
 - 2. Core: Type X.
 - 3. Mold Resistance: ASTM D 3273, score of 10.
- D. Fasteners: Shall be installed in accordance with Gypsum Board specification section.
 - 1. Type: Stainless steel.
- E. Installation: Refer to Section 09 2900 "Gypsum Board".

2.4 GYPSUM SHEATHING –INSIDE AND OUTSIDE CORNER TREATMENT

- A. Basis of Design: Shall be Rigid Vinyl beads as manufactured by TRIM-TEX Drywall Products, www.trim-tex.com, and is the standard of quality against which the architect will judge equivalency of materials. Substitutions: Refer to Section 01 2500

1. Material: Rigid Vinyl
2. Type: Adhesive and Fastener set
3. Series: Architectural.
4. Products:
 - a. Outside 90 degree corner: Model RJ10 Rigid Jumbo with 1 3/4 -inch legs
 - b. Outside radius/archway corner: Model RJA10 Rigid Jumbo with 1 3/4 -inch legs
 - c. Outside adjustable corner: Model RS10 Rigid Splayed with 1 3/4 -inch legs
 - d. Inside 90 degree corner: Model 4310 with 1 -inch legs by 10 -feet long
 - e. Inside adjustable corner: Model 4310 with 1 -inch legs by 10 -feet long
 - f. Inside radius/archway corner: Model 4150 with 1 -inch legs by 10 -feet long
 - g. Specialty shapes: Refer to Drawings
 - h. Expansion joints:
 - 1) Low Profile: Model 2170 by 10 -feet long
 - 2) Deep "V": Model 093V-12 by 12 -feet long
 - i. Reveals:
 - 1) Field Reveals: "AS" Series with reveal size as selected by Architect.
 - 2) Edge Reveals: "AS" Series with reveal size as selected by Architect.
 - 3) Custom Intersections: "T", Four way, Outside corner, etc.
 - 4) Decorative colored reveal insert: Color as selected by Architect from mfg's standard selection.

B. Installation

1. Typical: Adhesive set with manufacturers approved adhesive:
 - a. Mfg: Trim-Tex.
 - b. Product: 847 Spray Adhesive.
2. Irregularities: Staple installed in accordance with Gypsum Board specification section.
 - a. Material: Stainless steel.
3. Reinforcing mesh as specified.

2.5 GYPSUM SHEATHING –JOINT TREATMENT

1. Sheathing Joint Tape: Type recommended by High Performance Acrylic Finish manufacturer for sealing joints between and penetrations through sheathing.

B. Tape

1. Material: Fiberglass mesh joint tape by weight specified.
2. Mfg: Acceptable to Dryvit.

2.6 COATINGS MATERIALS, GENERAL

- A. Compatibility: Provide water-resistive coating, adhesive, fasteners, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by High Performance Acrylic Finish manufacturer for Project.
- B. Water: Potable and shall be clean and free of foreign matter.
- C. Material Quality: Provide manufacturer's highest grade of the various coatings specified.
 - 1. Materials not displaying manufacturer's product identification are not acceptable.
- D. Base coat, reinforcing mesh, primer and finish material containers not displaying manufacturer's product identification will NOT be acceptable.
- E. Base-Coat Materials: High Performance Acrylic Finish manufacturer's standard mixture complying with the following requirements:
- F. Textures and Colors:
 - 1. As indicated on Drawings or specified.

2.7 HIGH PERFORMANCE ACRYLIC FINISHES FOR INDOOR POOL, MATERIALS

- A. Basis of Design: Shall be system comprised of components as specified and as manufactured by Dryvit Company, www.dryvit.com installed over specified substrate.
 - 1. No substitutions
- B. Base Coat:
 - 1. Cementitious: A liquid polymer-based material, which is field mixed in a 1:1 ratio by weight with Portland Cement.
 - a. Shall be Genesis®.
 - 2. Ready mixed: A dry blend cementitious, co-polymer based product, field mixed with water.
 - a. Shall be Genesis DM™.
- C. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other acrylic finish materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per ASTM E 2098; bearing the System Manufacturer logo for identification, complying with ASTM D 578 and the following:
 - 1. Application:
 - a. Over gypsum board sheathing.
 - 2. It shall be colored blue for product identification bearing the Dryvit logo.
 - 3. Schedule:
 - a. Ceilings:
 - 1) Standard-Impact Reinforcing Mesh: Not less than 4.0 oz./sq. yd. (136 g/sq. m).
 - b. Walls:
 - 1) High Standard-Impact Reinforcing Mesh: Not less than 6 oz./sq. yd.
 - c. Strip Reinforcing Mesh: Not less than 4.0 oz./sq. yd.

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- d. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
- e. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m).

D. Primer

- 1. Shall be: Color Prime™ a pigmented, acrylic based primer used to improve adhesion and uniformity of finish color.
 - a. Manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat, comply with the VOC content limits specified in related section.

E. Finish-Coat Materials: High Performance Acrylic Finish manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following:

- 1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.

F. Finishes: Shall be the type, color, and texture as selected by the Architect and shall be one or more of the following:

- 1. Medallion Series PMR™ (Proven Mildew Resistance): Water based acrylic finishes with integral color and texture, and formulated with PMR (Proven Mildew Resistance) chemistry:
 - a. Sandpebble Fine PMR: Fine pebble texture.

G. Colors:

- 1. Custom color as provided by Architect for applicable finishes.
- 2. As selected by Architect from manufacturer's full range where custom colors are not available.

H. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat where required by manufacturer.**2.8 ELASTOMERIC SEALANTS****A. Elastomeric Sealant Products:** Provide High Performance Acrylic Finish manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C 1481 and with requirements in Division 07 Section "Joint Sealants" for products corresponding to description indicated below:

- 1. Single-component, nonsag, neutral-curing silicone sealant.

B. Sealant Color: As selected by Architect from manufacturer's full range.**PART 3 - EXECUTION****3.1 DESCRIPTION OF WORK, GENERAL**

- A. Extent of wall and ceiling coating work is indicated on drawings and schedules, as herein specified.

- B. Work includes masking, protection of adjacent surfaces, priming, finishing, and cleanup of all High Performance Acrylic Finish areas throughout the project as designated on the drawings and finish schedules, except as otherwise specifically indicated.
- C. High Performance Acrylic Finish as used herein means specialty texture acrylic coatings having a minimum thickness meeting the minimum performance specifications stated herein.
- D. Work specified in other sections: Paint, stain, primer, other specialty coatings, fire proofing, tile, masonry, pre-finished panels, stains, preservative treatments, shop applied finishes, wall coverings, etc.
- E. Perform preparation and cleaning procedures in accordance with manufacturer's recommendations and as herein specified, for each particular substrate condition.
- F. Clean surfaces to be coated before applying any materials.
 - 1. Remove oils and grease prior to mechanical cleaning.
 - 2. Program cleaning and coating so that contaminants from cleaning process will not fall into wet or newly coated surfaces.

3.2 EXAMINATION

- A. Prior to installation of the Dryvit Architectural Finishes For Indoor Pool Areas, the Contractor shall ensure that the substrate is as specified.
- B. The Contractor shall notify the General Contractor and/or Architect and/or Owner of all discrepancies.
 - 1. Work shall not proceed until discrepancies have been corrected.
 - 2. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.
- C. Coordination of Work:
 - 1. Review wall framing is acceptable to install gypsum sheathing.
 - 2. Review substrates are acceptable and ready to be prepared for finishing.
- D. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

3.3 PREPARATION

- A. The substrate shall be prepared so as to be free of foreign materials such as oil, dust, dirt, form-release agents, efflorescence, loose paint, wax, water repellents, moisture, frost and any other materials that inhibit adhesion.
- B. Concrete and masonry.
 - 1. Shall be dry and cured a minimum of 28 days.
- C. Gypsum board sheathing substrate.
 - 1. Surface shall be cleaned to remove all dust, dirt, or other contaminants that may impair the adhesion of a surface coating.

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- D. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing operations, use workers skilled in the trades involved to reinstall items that were removed.
 - a. Remove surface-applied protection.

3.4 SURFACE PREPARATION:

- A. Gypsum Board:
 - 1. Refer to Dryvit's printed literature for finish specified.
 - 2. Drywall shall be prepared to industry acceptable standard for hanging vinyl wall covering. Remove excess gypsum compound dust.
 - a. Refer also to Section 09 2900 "Gypsum Board".
 - 3. Do not prime or seal the drywall except as specifically recommended by High Performance Acrylic Finish manufacturer.
 - 4. For fast drying conditions, dampen surface slightly with a light spray mist of water just prior to application of acrylic wall coating materials.

3.5 SUBSTRATE PROTECTION APPLICATION

- A. Water-Resistive Coatings: Apply over substrates to protect substrates from degradation and to provide water-/weather-resistive barrier.
 - 1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by High Performance Acrylic Finish manufacturer's written instructions.

3.6 INSTALLATION - ACCESSORIES

- A. Install trim beads for outside corners, inside corners, etc. in accordance with manufacturers recommendations, this specification and the following:
 - 1. Section 09 2900 "Gypsum Board".

3.7 BASE-COAT INSTALLATION

- A. Base Coat: Apply to exposed surfaces of gypsum sheathing in minimum thickness recommended in writing by High Performance Acrylic Finish manufacturer, but not less than **1/16-inch (1.6-mm)** dry-coat thickness.
- B. Reinforcing Mesh:
 - 1. Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than **2-1/2 -inches (64 mm)** or otherwise treated at joints to comply with ASTM C 1397 and High Performance Acrylic Finish manufacturer's written instructions.
 - 2. Do not lap reinforcing mesh within **8 -inches (204 mm)** of corners.
 - 3. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
 - 4. Schedule: As scheduled unless indicated to be greater weight in Drawings

- C. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 -inches (100 mm) beyond perimeter. Apply additional 9-inch by 12-inch (230-by-300-mm) strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch (200-mm-) wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 -inches (100 mm) on each side of corners.
 - 1. Detail Reinforcing Mesh:
 - 2. Corner Reinforcing Mesh:
 - 3. At aesthetic reveals, apply strip reinforcing mesh not less than 8 -inches (200 mm) wide.
 - 4. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.
- D. Foam Shapes: Fully embed reinforcing mesh in base coat.
- E. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application except without reinforcing mesh. Do not apply until first base coat has cured.

3.8 APPLICATION – COATING SYSTEM

- A. The Dryvit materials shall be mixed and applied in accordance with Dryvit's published product data sheets for the individual products specified.
- B. Application
 - 1. Apply a layer of base coat mixture to the wall surface at an approximate thickness of 1/16 -inch (1.6 mm).
 - a. Immediately place the reinforcing mesh into the wet base coat layer and trowel smooth so the mesh is fully embedded.
 - b. Lap adjacent pieces of mesh a minimum of 2 1/2 -inch (64 mm). Continue until the entire wall surface is covered.
 - c. Allow to cure a minimum of 24 hours until completely dry. Cool, humid conditions may require longer cure times.
 - 2. Using a brush, roller, or airless spray equipment, apply a coat of Color Prime over the prepared wall surface and allow to dry.
 - 3. Apply the specified finish in accordance with Dryvit's published installation instructions.

3.9 APPLICATION – COATING SYSTEM AND WALL TILE FINISH

- A. Refer to Coordination Mockups heading, article QUALITY ASSURANCE as specified for sequence of application of wall tile liquid applied Air Barrier / Waterproof membrane and Air Barrier and Finish coats as specified in this specification
- B. Application
 - 1. Shall be in compliance with approved "Coordination Mockup"

3.10 FIELD QUALITY CONTROL

- A. The Contractor shall be responsible for the proper application of the Dryvit materials.
- B. Dryvit assumes no responsibility for on-site inspections or application of its products.

- C. Dry Film Thickness Testing: Engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.11 SCHEDULE

- A. Indoor swimming Pool room 404:
 - 1. Ceiling.
 - 2. Walls shall be full height Tile finish with assembly the same as a shower.
- B. Pool Equipment room 414:
 - 1. Ceiling.
 - 2. Walls.
- C. Open Bar room 401:
 - 1. Ceiling.
 - 2. Walls.
- D. Swimming Pool Storage room 425:
 - 1. Ceiling.
 - 2. Walls.
- E. Refer to Drawings for locations that would be listed differently for finish and govern upon approval of shop drawings related to finish.

3.12 CLEANING AND PROTECTION

- A. All excess Dryvit materials shall be removed from the job site by the Contractor in accordance with contract provisions.
- B. All surrounding areas, where Dryvit finishes have been installed, shall be left free of debris and foreign substances resulting from the Contractor's work.
- C. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- D. After completing coating application, clean spattered surfaces.
 - 1. Remove spattered coatings by washing, scraping, or other methods.
 - 2. Do not scratch or damage adjacent finished surfaces.
- E. Protect work of other trades against damage from coating operation.
 - 1. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

- F. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.
- G. Dryvit finishes and the project shall be protected from damage and exposure to dust and other contaminants until dry.

- END OF SECTION -

- SECTION 09 9646 -**INTUMESCENT FINISHING**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and application of fire-retardant coatings and intumescent paint to interior items and surfaces.

1.3 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 6116 "Volatile Organic Compound (VOC) Restrictions".
- C. Section 09 9123 "Interior Painting" for primers, finish coats that may be used with intumescent paint finishes.
- D. Section 09 9123.13 "Paint Schedule".
- E. Section 09 9300 "Staining and Transparent Finishing" for primers, finish coats, and wood stains that may be used with intumescent paint finishes.

1.4 REFERENCES

- A. "Phoenix Building Construction Code", International Building Code 2006, with City of Phoenix administrative provisions and amendments.

1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.

1. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include manufacturer's recommended spreading rate for each separate coat for each type of substrate indicated.

D. VOC Submittals:

1. Product Data – VOC Limits: For adhesives sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 6116.
2. Low/No-VOC Paints and Coatings. Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 6116. List manufacturer, brand, application, type (flat or non-flat), number of gallon, and the VOC emissions in grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.

E. Samples for Verification: For each type of coating system and each color and gloss of intumescent paint finish indicated. Coordinate submittals with those of finish topcoats specified in related sections.

1. Submit Samples on actual substrate, not less than 8 -inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

F. Samples for Initial Selection: For each intumescent paint finish indicated.

1.6 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For each intumescent paint.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain each paint system from single source from single manufacturer or provide a system approved in writing by intumescent paint manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index:
 - a. Class A: 25 or less.
 - b. Class B: 26 to 75.
 2. Smoke-Developed Index: 450 or less.
- C. Mockups: Apply benchmark Samples of paint system indicated and of each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one actual substrate of each type to represent surfaces and conditions for application of coating.
 - a. Wall Surfaces: Prepare Samples of at least 100 sq. ft. (9.3 sq. m).

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2. Apply benchmark Samples after permanent lighting and other environmental services have been activated.
 3. Final approval of color selections will be based on benchmark Samples.
 - a. If preliminary color selections are not approved, apply benchmark Samples of additional colors selected by Architect at no added cost to Owner.
- D. Preinstallation Conference: Conduct conference at Project Site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000.
- B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.9 PROJECT CONDITIONS

- A. Apply waterborne intumescent paints only when temperatures of surfaces to be painted and ambient air temperatures are between 50 and 90 deg F (10 and 32 deg C).
- B. Allow wet surfaces to dry thoroughly and to attain temperature and conditions specified before starting or continuing coating operation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives sealants, fillers and primers. Comply with limits specified in Section 01 6116.
- B. VOC Limits for all primers and coatings: Comply with limits specified in Section 01 6116.

2.2 INTUMESCENT PAINT MATERIALS, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each material or coat, provide products and spreading rates recommended in writing by intumescent paint manufacturer for use on substrate indicated. Comply with requirements for fire-retardant coating classification and surface-burning characteristics indicated.
- B. Colors and Gloss: As selected by Architect from manufacturer's full range.

2.3 INTERIOR, CLEAR, INTUMESCENT PAINT SYSTEM

- A. Stain Coat: Factory-formulated, nonbleeding, penetrating wood stain. Type specified in Section 09 9300 "Staining and Transparent Finishing".
 - 1. Stain approved by intumescent paint manufacturer.
- B. Clear Sanding Sealer: Type for interior wood surfaces, specified in Section 09 9300 "Staining and Transparent Finishing".
- C. Fire-Retardant Intumescent Paint: Water-based, fire-retardant paint for interior wood and other combustible surfaces.
 - 1. Basis of Design Product: Flamort Fire Retardant Paint; Flamort Co., Inc. 2368 Alvarado Street San Leandro, CA. 94577 PH. 510-357-9494.
 - a. Tested by UL to ASTM E-84 Class 'A': Flame Spread: 25, Smoke Development: 35
 - b. CA. State Fire Marshal Registration: C-00414
 - c. Solids: 48%, + / - 2%.
 - d. VOC: 30.8 g/l.
 - 2. Substitutions: Section 01 2500.
- D. Fire Retardant For Finished Wood: clear, water-base, penetrating type fire retardant for use on unfinished, bare wood surfaces.
 - 1. Basis of Design Product: Flamort 6-3; Flamort Co., Inc. 2368 Alvarado Street San Leandro, CA. 94577 PH. 510-357-9494.
 - a. Tested by UL to ASTM E-84 Class 'A': Flame Spread: 25, Smoke Development: 5
 - b. CA. State Fire Marshal Registration: C-00416
 - c. VOC: 0.
 - 2. Substitutions: Section 01 2500.
- E. Fire Retardant For Finished Wood: Clear, non-toxic, penetrating type fire retardant for use on unfinished, bare wood surfaces. The natural look of the wood is retained after the application, and may be finished with most conventional non-water based finishes.
 - 1. Basis of Design Product: Flamort WC; Flamort Co., Inc. 2368 Alvarado Street San Leandro, CA. 94577 PH. 510-357-9494.
 - a. Tested by UL to ASTM E-84 Class 'B': Flame Spread: 65, Smoke Development: 55
 - b. CA. State Fire Marshal Registration: C-00404
 - c. Solids: 16.6 percent
 - d. VOC: 0.
 - 2. Substitutions: Section 01 2500.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with manufacturer's requirements for surface treatments, shop-primed surfaces, maximum moisture content, and other conditions affecting performance of the Work.

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- B. Begin coating only when moisture content of wood substrate is 15 percent or less when measured with an electronic moisture meter.
- C. Verify suitability of substrates, including surface conditions, and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.
- B. Remove hardware and hardware accessories, plates, machined surfaces, light fixtures, and similar items already installed that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances, including dirt, oil, grease, and incompatible paints and encapsulants, that could impair bond of coatings. Do not coat surfaces if surface moisture content or alkalinity exceeds that permitted in manufacturer's written instructions.
 - 1. Remove incompatible primers, and reprime substrate with compatible primers as required to produce coating systems indicated.
 - 2. Perform cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.

3.3 APPLICATION

- A. General: Apply intumescent paints according to manufacturer's written instructions and to comply with requirements for fire-retardant coating classification.
 - 1. Use equipment and techniques best suited for substrate and type of material being applied.
 - 2. Coat surfaces behind movable items the same as similar exposed surfaces.
 - 3. Apply each coat separately according to manufacturer's written instructions.
- B. Apply coatings to prepared surfaces as soon as practical after preparation and before subsequent surface soiling or deterioration.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
 - 1. Pigmented Finishes: If undercoats or other conditions show through pigmented topcoat/overcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
 - 2. Clear Finishes: Produce a smooth surface film of even sheen using multiple coats.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities, touch up and restore damaged or defaced coated surfaces.

3.5 PAINT SYSTEM SCHEDULE

- A. Locations: Wood surfaces as scheduled or indicated to require Class A or Class B fire retardant finishes.
- B. Prime Coat: If required and approved by intumescent paint manufacturer.
- C. Fire-Retardant Intumescent Coating: Minimum number of coats required to comply with requirements for fire-retardant coating classification and surface-burning characteristics indicated.
- D. Topcoat/Overcoat: Apply if required or recommended and approved by intumescent paint manufacturer.

- END OF SECTION -

- SECTION 09 9723 -**CONCRETE AND MASONRY COATINGS
(SWIMMING POOLS)**

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Perform work in accordance with Drawings and general provisions of Contract, including General Conditions of Contract, Supplementary Conditions, and Division 1 General Requirements.

1.2 REFERENCE

- A. Requirements in Addenda, Alternates and Conditions collectively apply to this work.

1.3 DESCRIPTION

- A. Principle Work Items Are:
 - 1. Swimming Pool Shell Waterproofing
 - 2. Swimming Pool White Plaster Finish
 - 3. Swimming Pool Start-Up & Maintenance
- B. Related Sections:
 - 1. 03 3719 – "Pneumatically Placed Concrete (Swimming Pool)"
 - 2. 07 1413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing" for building waterproofing prior to additional waterproofing specific to swimming pools
 - 3. 07 1416 "Cold Fluid-Applied Waterproofing (Swimming Pool)" for additional waterproofing at swimming pools
 - 4. 09 3013 – "Swimming Pool Ceramic Tile"
 - 5. 13 1133 – "Elevated Swimming Pool"
 - 6. 13 1146 – "Swimming Pool Accessories"
 - 7. 13 1149 – "Swimming Pool Cleaning Equipment"

1.4 SUBMITTALS

- A. Samples: Prepare 12-inch square panel at site showing color and texture for White Plaster Finish shall match approved sample panel.

- B. Certificates: Submit certificates attesting that materials furnished meet requirements specified herein.
- C. Test Report: Submit results of domestic water analysis.

1.5 PRODUCT DELIVERY AND STORAGE

- A. Deliver manufactured materials to site in manufacturers' original unbroken packages or containers bearing manufacturers' name and brand labels. Keep cementations materials dry until ready to be used and stored off ground, under cover, and away from damp surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C150, Type I white Portland Cement
- B. Hydrated Lime: ASTM C206, Type S.
- C. Sand for Pool Plaster Finish Coat: White marble dust uniformly graded within the following limits: All passing the No. 30 sieve
- D. Percentage retained (by weight plus or minus 2%) on each sieve
 - 1.

Sieve Size	Minimum	Maximum
No. 30	0	30
No. 50	40	55
No. 100	70	80
No. 200	80	100
- E. Water shall be clean, fresh, potable, and free of oils, acids, alkalis, and organic matter injurious to cementitious material.

2.2 PLASTER PROPORTIONS AND MIXING

- A. Materials are specified on a volume basis and shall be measured in approved containers that shall ensure that the specified proportions shall be controlled and accurately maintained during the progress of the work. Measuring materials with shovel blade ("shovel count") is not permitted.
- B. White Marble Pool Plaster Finish Coat: Mix finish in proportion of one part by volume of white Portland Cement to not more than two parts by volume of sand (specified white marble dust).
- C. Mixing: Perform mixing in approved mechanical mixers of the type in that quantity of water can be controlled accurately and uniformly. While mixer is in continuous operation, change approximately 90% of estimated quantity of water, half of sand, all cement, and the other one-half of the sand into the mixer in that sequence, and mix thoroughly with remainder of water until mixture is uniform in color and consistency. Avoid excess mixing to prevent hasty solution of cement resulting in accelerated set. Discard plaster that has begun to set before it is used.

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- D. Re-tempering not permitted. Do not use any caked or lumpy materials. Completely empty mixer and mixing boxes after each batch is mixed and keep free of old plaster.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Remove existing plaster surface (if applicable) down to the structural shell of the pool.
- B. Clean base surfaces of projections, dust, loose particles, grease, bond breakers, and foreign matter; make sufficiently rough to provide a strong mechanical bond. Thoroughly wash entire surface with 6,000-psi high-pressure water immediately prior to plastering (if applicable). Wet cementitious base surfaces with a fine fog water spray to produce a uniformly moist condition and check screeds, pool equipment, and accessories for correct alignment before plastering is started. Do not apply plaster to base surfaces containing frost. Install temporary coverings as required to protect adjoining surfaces from staining or damage by plaster operation.

3.2 PLASTER APPLICATION

- A. General: Apply finish plaster to minimum 5/8 inch thickness at any location. Apply finish plaster by hand or machine. If plastering machine is used, control fluidity of plaster to have a slump not exceeding 2-1/2 inches when tested using a 2" by 4" by 6" high slump cone. Do not add additional water to the mix subsequent to determining water content to meet this slump. Perform slump test according to the following procedure:
1. Place cone on level, dry, non-absorptive base plate.
 2. While holding cone firmly against base plate, fill cone with plaster taken directly from the hose or nozzle of plaster machine, tamping with metal rod during filling to release all air bubbles.
 3. Screed off plaster level with top of cone. Remove cone by lifting it straight up with a slow and smooth motion.
 4. Place cone in a vertical position adjacent to freed plaster sample using care not to jiggle the base plate.
 5. Lay straightedge across top of cone being careful not to vibrate cone; measure slump in inches from bottom edge of straightedge to the top of the slumped plaster sample.
- B. Workmanship: Apply finish plaster in two coats by "double back" method with second coat applied as soon as first coat is tamped and initially floated. Apply plaster with sufficient pressure to provide a good hold on bond bases. Work plaster to screeds at intervals from 5 feet to 8 feet or closer as required on curved surfaces. Finish plaster to tolerance of -0 to +1/8 inch in thickness and to 1/8 inch in 8 feet of straight pits, crazing, discoloration, projections, or other imperfections. Form plaster carefully around curves and angles, well up to screeds. Take special care to prevent sagging and consequent drooping of applications. Produce surfaces free of visible junction marks in finish coat where one day's work adjoins another.
- C. Curing: Fill the pool with local potable water supply. Water provided by owner. Prevent damage or staining of plaster by toweling of curing.

- D. Patching, pointing, and Cleaning-Up: Upon completion, cut out and patch loose, cracked damaged, or defective plaster; patches matching existing plaster in texture, color, and finish, flush with adjoining plaster. Perform pointing and patching of surface and plasterwork abutting or adjoining any other finish work in a neat and workmanlike manner. If 5 percent or more of the pool's plaster finish is found to be defective, the plaster shall be removed and replaced complete for the entire pool. Remove plaster droppings or spattering from all surfaces. Leave plaster surfaces in clean, unblemished condition ready for pool filling. Remove protective coverings from adjoining surfaces. Remove rubbish and debris from the site.

3.3 START-UP

- A. Contractor shall employ qualified water testing agency to analyze domestic water with which pool will be filled within 2 weeks of plaster date and shall employ swimming pool experienced water chemistry consultant to determine types and quantities of chemicals required to ensure calcium-balanced water immediately upon completion of water filling.
1. Have on hand quantities of chemicals as determined above, plus 25% overage for follow-up treatment. These chemicals, typically including calcium chloride, bicarbonate of soda, and muriatic acid, are in addition to standard chlorine products and pH control products required elsewhere.
- B. Pool shall not have interior finish applied until filtration system and chlorination system are complete and ready for start-up. Contractor shall notify Owner in writing of start-up at least two weeks prior to interior finish date. Owner is responsible for supplying halogen products and pH control products for maintenance of pool by automatic treatment systems. Should these automatic treatment systems fail, or Contractor fail to notify owner as required, Contractor shall supply chemicals required for manual treatment of pool water for the first two weeks of operation.
- C. Contractor shall flush entire system, including water source, prior to Pebble Fina® application to assure clean and potable water availability at time of application. Contractor is responsible to clear residue and debris from installed system piping prior to application. Water source shall be verified as clean and potable prior to application of Pebble Fina®.
- D. Contractor shall maintain swimming pool for 14 consecutive days in conjunction with mechanical system operational test. This maintenance period shall be extended with mechanical system operational test if required per specifications. During this time, brush entire pool plaster service daily starting immediately after filling pool for minimum of 5 days to remove dust, periodically clean grates until no further accumulation of foreign materials occurs, and add chemicals as required for acceptable water quality. Pool shall be vacuumed throughout 14-day period starting no sooner than 5 days after date of interior finish application. After successful conclusion of mechanical system operational testing, clean grates, vacuum pool, and leave pool ready for use.

- END OF SECTION -