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{BASED ON 1995 CSI MASTERFORMAT}

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SECTION 01110

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY: The Work includes the complete construction of the:

FOX ENTERTAINMENT GROUP
NEW OFFICE BUILDING - STUDIO AREA ONE
10201 West Pico Boulevard
Los Angeles, California 90035

in strict conformance with the Drawings and Project Manual prepared by:

LANGDON • WILSON
ARCHITECTURE PLANNING INTERIORS
1055 Wilshire Boulevard, Suite 1500
Los Angeles, California 90017
Telephone: 213/250-1186
Fax: 213/482-4654

1.02 WORK NOT IN THE CONTRACT: "NIC" means "Not In Contract". The following portions of the Work will be provided by Owner under separate contract or other arrangement:

A. Portable furnishings and equipment.
B. Tenant improvements in Lease Space areas not indicated on the Drawings or specified unless included in the Contract by Modification procedure based on accepted Alternate Bids and Unit Prices or otherwise as ordered by the Owner.
C. All other items indicated or specified as NIC.

1.03 PERFORMANCE REQUIREMENTS FOR COMPLETED WORK: The Contract Documents show the intended occupancy and use of the construction, and the individual systems and facilities. Compliance with governing regulations is intended and required for the Work and for the Owner's occupancy and use.

1.04 DISCREPANCIES: In the event of a discrepancy between small scale drawings and large scale details, or between the Drawings and the Project Manual, or within the Project Manual, immediately bring the discrepancy to the Architect's attention for decision before proceeding with the particular Work involved. Work carried out disregarding this instruction is subject to removal and replacement at the expense of the Contractor.

1.05 MINIMUM QUALITY AND QUANTITY: In each instance, quality level or quantity indicated or specified is intended as a minimum for the Work to be performed or provided. Except as otherwise indicated or specified the actual Work may comply exactly with that minimum (within specified tolerances) or may exceed that minimum within reasonable limits. In complying with the requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of the requirements. Refer instances of uncertainty to the Architect before proceeding.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01150

DESIGN-BUILD REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers general requirements for the portions of the Work to be provided by the Contractor under the design-build procedure.

1.02 SUBMITTALS: Submittals required under the design-build procedure shall conform to Section 01330.

1.03 DESIGN-BUILD PROCEDURE:

A. Design Intent: Various Sections of Specifications may state that the Work of the Sections is to be provided under the "design-build procedure". Requirements specified in such Sections and pertaining requirements on the Drawings establish the criteria, design intent, basic dimensions and layouts, required appearances and profiles, kinds of materials and usage, and the performance requirements for involved portions of the Work. In event of dispute regarding the Contractor's proposed design and the "design intent", decision of the Architect will govern.

B. Responsibility: To avoid any misunderstanding or lack of interpretation, the Contractor is hereby advised that responsibility for the portions of Work to be provided under "design-build" procedure is totally the Contractor's including all required approvals by the Building Department and other public authorities having jurisdiction of the Work and for costs thereof, subject in all cases to prior approval of the Owner and Architect.

C. Proposed Designs: The Contractor's proposed design solutions which follow exactly the details on the Drawings will not relieve the Contractor of the total responsibility for approved design, fabrication, erection and performance of the "design-build" Work. Design resolutions proposed in the Contractor's submittals and the structural calculations and other engineering, and related documentation and certification must demonstrate conformance with the information on the Drawings and in Specifications, and with design intent specified above. No compensation for omissions or errors on the part of the Contractor or of any Subcontractor in designing and providing "design-build" portions of the Work will be allowed. Contractor's design submittals shall be prepared in accordance with requirements of Section 01330, and submitted to and approved by the Architect for conformance with the design intent prior to submission to the governing Building Department.

D. Engineering: Portions of Contractor's designs and design submittals requiring engineering design (i.e., civil, structural, mechanical, electrical, etc.) shall be prepared, sealed, and signed by an engineer employed and paid by the Contractor and registered in the appropriate discipline in California.

E. Adjustments: Unless otherwise restricted in the involved Sections, minor dimension changes and detailing adjustments may be made in the proposed designs in the interest of fabrication or erection methods, weatherability factors, or ability to satisfy design and performance requirements provided the general design and performance intent are maintained. Such changes and adjustments are subject to the prior approval of the Architect and Owner.

F. Ancillary Materials: The Contractor's proposed designs shall include all supplementary parts and materials required to complete the "design-build" Work even if not definitely indicated or specified, and Contractor shall provide all the anchor assemblies to meet performance and design requirements and all inserts, fasteners, clips, bracing, framework, and similar items and materials required, even if not shown, for proper anchorage of "design-build" Work to building structure and adjoining and related Work, all of which shall conform to Building Code and all other governmental requirements.

G. Fabrication Inspection: If governing Code or Building Official requires any of the design-build Work be fabricated in a licensed fabricator shop registered with the Building Official and authorized to certify the

fabrication without inspection or, in lieu thereof, be fabricated under inspection, the Contractor shall have that part(s) of the Work fabricated in a licensed fabricator's shop or shall have such design-build Work fabricated under continuous inspection of an appropriate Testing Laboratory Inspector or a qualified and licensed inspector approved by Building Official and employed and paid by Contractor. If Testing Laboratory performs the required continuous fabrication inspection in an unlicensed shop, all costs incurred by the Owner for such inspection service will be deducted from the payments due the Contractor. Appropriate certification from the licensed fabricator shop or complete and detailed inspection reports signed by each inspector performing unlicensed shop inspection shall be furnished to the Architect before the design-build Work so involved is delivered to the site.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01210

ALLOWANCES

PART 1 - GENERAL

1.01 SUMMARY: Furnish following portions of the Work for the Cash Allowance amounts stated. Refer to Conditions of the Contract for costs chargeable to the Cash Allowance amounts. Include the total of all Cash Allowance amounts in the Contract Sum.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Prepare and submit the Shop Drawings, Samples, and Product Data requested by Architect. Submittal costs are not chargeable to the Cash Allowance amounts.

1.03 CASH ALLOWANCES: Materials to be furnished under the Cash Allowances and the pertaining Cash Allowance amounts shall be as directed by the Owner. Furnish materials according to the Architect's selections and instructions.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01230

ALTERNATES

PART 1 - GENERAL

1.01 SUMMARY: This Section summarizes the Alternate Bids to be submitted to the Owner. Alternate Bids shall state the NET AMOUNT to be ADDED TO or DEDUCTED FROM the BASE BID PRICE or Contract Sum, as applicable.

A. Acceptance or Rejection: Acceptance or rejection of each Alternate Bid is at the Owner's discretion. None, any, or all Alternate Bids may be accepted or rejected in any sequence by the Owner.

B. Costs: Include in Alternate Bids the net amount of all changes in costs, whether additive or deductive, resulting to the Work of all Sections affected by Alternate Bids.

C. Extent of Alternate Bids: Bidders shall determine the full extent of Work affected by each Alternate Bid and shall make full and proper allowance for such extent in the preparation of Bids.

1.02 DESCRIPTION OF ALTERNATE BIDS: Following are minimum requirements and shall govern except as exceeded by requirements of the Drawings, other Sections, or Code. Workmanship and materials not modified under the Alternate Bids shall conform to the Drawings and pertaining Sections of the Project Manual.

(ALTERNATES AS DIRECTED BY THE OWNER)

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01270

UNIT PRICES

PART 1 - GENERAL

1.01 SUMMARY: The Contract Sum will be increased or decreased according to the quantities of added or omitted Work based on unit prices accepted by Owner, when applicable. Quoted unit prices shall be the actual NET amount to be used in calculation of changes in the Work with no further addition of overhead, profit, or other charges of any kind.

A. Costs Included: Unit prices shall cover and include all costs and charges including, without limitation, the cost of materials, labor, fabrication, delivery, unloading, handling, protection, storage, hoisting, scaffolds, tools, equipment, rentals, utilities, installation or application, cleaning up, supervision, taxes, employer's contributions, insurance, bonds, overhead, and profit.

B. Unbalanced Unit Prices: Proposed unit prices that are so unbalanced as to be detrimental to the Owner's interests, as determined solely by the Owner, will be rejected and may invalidate the entire Bid at the Owner's discretion.

C. Bid Form Quotations: Unless otherwise required by the Bid Form or directed by the Owner, for each unit price item of the Work, each Bidder shall quote in the Bid Form an ADD price for added Work and a DEDUCT price for omitted Work.

D. Duration of Unit Prices: All unit prices shall be held good and unchanged until the Date of Substantial Completion unless otherwise specified or agreed.

1.02 UNIT PRICES: As specified in pertinent Sections or directed by the Owner.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01310

PROJECT COORDINATION

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements for Contractor's responsibility for all Project coordination.

1.02 PROJECT COORDINATION PROCEDURES: Without limitation, Contractor duties include:

A. Coordination: Coordinate the Work of all Subcontractors. Allocate the spaces for temporary structures furnished by Subcontractors, monitor the use of temporary utilities, and administer traffic and parking controls. Establish on-site lines of authority and communication.

1. Schedule and conduct progress meetings with the Owner and Architect (refer to Section 01315).
2. Use sequentially numbered and dated forms to document requests for information and clarification (refer to Section 01315).
3. Resolve conflicts which may develop among Subcontractors and vendors over access to and the use of the restricted spaces available for construction activities, materials, and equipment.

B. Staff: Furnish and maintain during entire Contract Time a competent staff of experienced construction administrative, and supervisory personnel in sufficient numbers to meet the Contract completion date.

C. Separate Contracts: Cooperate with other contractors, if any, performing work at the project site under separate contracts.

D. OFCI Items: Cooperate and coordinate with the Owner in accommodating Owner-furnished materials, furnishings, or equipment, if any, and its installation.

E. Construction Schedule: Prepare detailed Construction Schedule for all Subcontractors and for the entire Work, monitor the Construction Schedule as the Work progresses, and revise the schedule at the appropriate intervals to reflect actual progress.

F. Schedule of Values: Furnish a detailed breakdown of the total Contract Sum organized by construction activity or Specification index (refer to Supplementray Conditions).

G. Changes: Recommend the necessary or desirable changes in the Work to the Architect. Review the Subcontractors requests for changes and substitutions; refer to Section 01630. Submit recommendations to the Architect. Process Change Orders.

H. Permit and Fees: Verify that Subcontractors have obtained permits for all required inspections. Verify that all applications for permits, inspections, temporary facilities, and permanent utilities are processed in a timely manner.

I. Submittals: Review the Shop Drawings, Product Data, Equipment Data, and Samples submitted to the Contractor by Subcontractors for compliance with Contract Documents in accordance with Section 01330 before submitting to the Architect.

J. Interpretation of Documents: Consult the Architect for interpretations of the Contract Documents, assist in resolution of questions which may arise, and transmit resolved interpretations in writing to all concerned parties.

K. Existing Facilities: Unless otherwise shown or specified locate, identify, protect and maintain existing water, gas, sewer, irrigation, and storm drain lines; lighting, power, and telephone conduits and wires; and all other existing surface or sub-surface structures and imp[rovements. Do not disturb, disconnect, or damage any of these improvements during progress of the Work. Maintain all existing planting and trees which are to remain. The Contractor shall satisfactorily repair or replace, at its expense, damage to existing improvements of all kinds, and to adjacent private and public property or rights-of-way, that results directly or indirectly from its operations.

L. Embedded Items: Coordinate furnishing and placing of embedded items, such as anchors, sleeves, and blockouts, with formwork, reinforcing steel, masonry, and other involved construction.

M. Cleaning: Verify that specified cleaning is performed during progress of the Work and at completion of each stage of the Work.

N. Start-Up: Direct checkout of utilities, operating systems, and equipment, assist initial start-up testing, record the operation start dates of the systems and equipment, and submit to the Architect written notice of completion of start-up operations and placing of equipment in service.

O. Substantial Completion: Upon determination of Substantial Completion of the Work, or a designated portion thereof, prepare for the Architect a list of all incomplete or unsatisfactory items. Upon the Architect's certification of the Date of Substantial Completion, supervise the correction and completion of the Work as determined necessary by the Architect.

P. Final Completion: Upon determination the Work is finally complete, submit written notice to Architect the Work is ready for final inspection. Secure and transmit to the Architect all required closeout submittals including, without limitation, operations and maintenance data, manuals, Record Documents, and all other required documents, and confirm delivery to the Owner of spare parts, extra materials, and maintenance materials.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01315

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements for project meetings.

PART 2 - PRODUCTS (Not Applicable to This Section)

PART 3 - EXECUTION

1.02 PROJECT MEETINGS:

A. Attendees: Unless otherwise specified or required by the Owner, meetings shall be attended by Owner, Architect, Contractor, and the Contractor's Superintendent. Subcontractors may attend the meetings when involved in matters to be discussed or resolved but only when requested by the Owner, Architect, or Contractor.

B. Meeting Records: The Contractor shall record the minutes of each meeting and furnish copies within a reasonable time thereafter to the Owner, Architect, and other attendees. Unless written objection to contents of the meeting minutes is received by Contractor within 10 days after presentation, it shall be understood and agreed that the minutes are a true and complete record of the meeting.

C. Meeting Schedule: Dates, times, and locations for various meetings shall be agreed upon and recorded at the pre-construction meeting. Thereafter, changes to the schedule shall be agreed between the Owner and the Contractor, with appropriate written notice to all parties involved.

1.03 PRE-CONSTRUCTION MEETING:

A. General: Before issuance of a Notice to Proceed, a pre-construction meeting shall be held at the location, date, and time designated by the Owner. In addition to the attendees named herein, this meeting shall be attended by representatives of the regulatory agencies having jurisdiction, if required, and such other persons the Owner may designate.

B. Agenda: The matters to be discussed or resolved and the instructions and information to be furnished to or given by the Contractor at the preconstruction meeting include:

1. Schedule of progress meetings.
2. Construction schedule and schedule of values submitted by Contractor.
3. Communication procedures between the parties.
4. Names and titles of all persons authorized by Contractor to represent and execute documents for Contractor, with samples of all authorized signatures.
5. The names, addresses, and telephone numbers of all those authorized to act for the Contractor in emergencies.
6. Insurance policies or certificates to be furnished by Contractor prior to the start of Work.
7. Insurance policies to remain in force after final acceptance of the Work.
8. Construction permit requirements, procedures, and posting.
9. Public notice of starting Work.
10. Forms and procedures for Contractor's submittals.
11. Change Order forms and procedures.
12. Contractor's provisions and procedures to be used for its quality assurance and quality control of the Work.
13. Payment application forms and procedures and revised progress schedule reports to accompany the applications.

14. Contractor's designation of its organization's accident prevention member and the qualifications of the designee if other than the Superintendent.
15. Contractor's provisions for barricades, traffic control, utilities, sanitary facilities, and other temporary facilities and controls.
16. Consultants and professionals employed by Owner and their duties.
17. Construction surveyor and initiation of surveying services.
18. Testing Laboratory or Agency, and testing procedures.
19. Procedures for payroll and labor cost reporting by the Contractor.
20. Procedures to ensure nondiscrimination in employment.
21. Warranties and guarantees.
22. Other administrative and general matters as needed.

1.04 CONSTRUCTION PROGRESS MEETINGS: These meetings shall be held according to an agreed schedule. All matters bearing on progress and performance of the Work since preceding progress meeting(s) shall be discussed and resolved including, without limitation, any previously unresolved matters, deficiencies in the Work or methods being employed for the Work, and problems, difficulties, or delays which may be encountered.

1.05 SPECIAL MEETINGS: After giving notice to other parties, special meetings may be called by the Owner, Architect, or Contractor. Special meetings shall be held where and when designated by the Owner.

1.06 POST-CONSTRUCTION MEETING: This meeting shall be held prior to the final inspection of the Work to discuss and resolve all unsettled matters. Bonds and insurance to remain in force, and the other documents required to be submitted by the Contractor will be reviewed and any deficiencies determined. Schedule and procedures for the final inspection and for final correction of defects and deficiencies shall be agreed.

1.07 REQUESTS FOR INFORMATION (RFI): The Contractor shall deliver requests for information only to the Architect. In case all reasonable attempts to resolve an item in question have been unsuccessful, typewritten RFI's in the form which follows this Section will be accepted by the Architect at the Construction Progress Meetings. In no case will an RFI submitted by a Subcontractor or supplier directly to the Architect be responded to by the Architect.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

REQUEST FOR INFORMATION

TO ARCHITECT: LANGDON WILSON ARCHITECTS
1055 WILSHIRE BOULEVARD
LOS ANGELES, CA 90017

RFI No. _____
DATE: _____
REQUESTED RESPONSE DATE:

ATTENTION: _____ _____

PROJECT: _____ SUB RFI No. _____
CONTRACTOR: _____ REQUESTED BY: _____
_____ PERSON: _____
_____ FIRM: _____
_____ Date: _____

SPEC REFERENCE: _____ DRAWING REFERENCE: _____

REQUEST:

REQUEST BY: _____ DATE: _____

RESPONSE:

RESPONSE BY: _____ DATE: _____

DISTRIBUTION:

SECTION 01320

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY: This Section specifies the general requirements for construction progress documentation and supplements any such documentation required elsewhere in the Contract Documents.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Qualifications: Qualifications of the proposed photographer(s), or proposed photography firm, shall be submitted to Owner and Architect for review and approval. Submittal shall cover the experience record of each photographer who will perform photography at the site, and experience record of photography firm if applicable, in preparing architectural presentation type photographs and shall include examples of firm's or of each photographer's presentation quality color work in photographing buildings and sites.

B. Schedule: Submit a proposed schedule for taking photographs.

C. Schedule of Values: State and submit the amount to be included in the Schedule of Values to cover Work of this Section.

D. Record Documentation: Submit photographs as required to confirm Record Documentation; refer to Section 01770.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 CONSTRUCTION PROGRESS PHOTOGRAPHS: The Contractor shall employ and pay a professional commercial photographer to take and prepare progress photographs as specified. Unless otherwise specified, photographs prepared under this Section shall be 8" by 10" size in full color with gloss finish.

A. Labeling: Attach to the back of each photographic print a self-adhering label of adequate size and bearing typed or printed information as follows, in permanent and non-transferring ink. Labels shall not affect the quality of the photographs, adhesive or labeling shall not "bleed" through to photograph face, and labels shall be removable without damage to photograph paper. Labels may be a pre-printed type, subject to approval of a Sample. Label on each photograph shall contain the following information:

1. Date and hour the photograph was taken.
2. Serial number assigned by photographer for future reference.
3. Project and Owner names.
4. Name of Architect.
5. Location of photograph and, for exterior photographs and other views where applicable, the compass direction of the photograph.
6. Brief description of the photograph subject and its specific location where not obvious.
7. Such other information as may be required to fully identify the contents and subject matter of the photograph.

B. Photographs Required: Contractor shall submit following photographs with each Application for Payment, photographs taken not more than four days prior to the date of the Application, with each submittal consisting of ___ fully labeled color prints of each photograph:

1. Type and Number of Photographs:

   a. Exterior photographs of each building and/or site elevation, one at long range sufficient to encompass the entire elevation and one at medium range showing the principal construction operations. Include _____ photographs of each elevation as approved by the Architect.
   b. Photographs showing site conditions during construction, locations and views as discussed with and approved by Architect, _____ photos in each submittal.
   c. Photographs of interior construction and finishing operations in progress, locations and subject matter discussed with and approved by the Architect in advance, _____ photographs.
   d. At time of Substantial Completion, ____ photographs of building exteriors and ____ photographs of designated interior features, all of architectural publication artistry and quality, with the views determined in advance with the Architect.

2. Additional Prints: After examining all the photographs in each submittal, the Architect will designate _____ photographs, of which the Contractor shall furnish _____ color prints of each in addition to the photographs required for submittals.

C. Negatives and Ownership: All photographs and all the original film negatives used in preparing the photographs shall be and remain the sole property of the Owner and shall not be used for any other purpose without the specific written permission of the Owner. The negatives shall be delivered to the Owner, each in an envelope customarily used commercially, each envelope identified the same as the photograph labels including the identifying serial number.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements and procedures for submittals.

A. Submittal Requirements In This Section:

1. Schedule of submittals and transmittals.
2. Deviations and revisions.
3. Contractor's review and approval.
4. Review, corrections, resubmittals, and approval.
5. Shop Drawings, Product Data, Equipment Data, and Sample submittals.
6. Manufacturers' instructions.
7. Materials furnished under standard specifications.
8. Certificates.

B. Submittal Requirements Not In This Section:

1. Record Drawings, manuals, and maintenance materials, Section 01770.
2. Warranties and guarantees, Section 01790.

1.02 SUBMITTAL REQUIREMENTS: Prepare and submit the submittals specified in this Section, under other Sections, or by Modifications except as otherwise indicated, specified, or directed. All the submittals shall be correctly prepared, identified, and transmitted as specified herein, unless otherwise directed. Prepare submittals according to the requirements herein and as may be specified in other Sections.

A. Conformance: Do not purchase or commence any Work covered by a submittal until the pertaining submittal is approved. Work shall conform to the approved submittals and all other requirements of the Contract Documents unless revised by Modification, in which case submit revised submittals as directed or required at no extra cost to the Owner. Do not start any related Work affected by Work covered in submittals until applicable submittals are approved, especially if machinery, equipment, piping, conduit, and the required arrangements and clearances are involved.

B. Schedule of Submittals: Construction Schedule submitted by the Contractor shall include an itemized listing of all required submittals with scheduled date for each submittal, and shall allow reasonable times for review by the Architect and the various Consultants plus time for delivery or return. Contractor shall consult with Architect regarding major and/or large submittals and time periods required by Architect for reviews prior to preparation of the Construction Schedule. No extension of the Contract Time will be granted because of Contractor's failure to make timely and correctly prepared and transmitted submittals with adequate and approved time allowance for the checking and review periods.

C. Transmittals: Deliver all submittals with a dated and sequence numbered transmittal letter typed on Contractor's letterhead, noted as to the initial or resubmittal status, and describing the submittal contents. Submittals are not acceptable directly from Subcontractors, suppliers, or manufacturers. In each transmittal state the Drawing numbers and the Specification Section, Articles, and Paragraphs to which the submittal pertains and identify all accompanying data, catalogs, drawings, sketches, and brochures in the same manner.

D. Deviations: Notify the Architect in transmittals of all deviations from requirements of the Contract Documents. Fully describe each deviation and all other changes required to correlate the Work including related Work. State in writing all variations in costs caused by each deviation and Contractor's assumption of costs for each deviation and of all related costs if a deviation is approved.

E. Contractor's Review and Approval of Submittals: Each submittal upon which proper execution of the Work is dependent shall bear the Contractor's review and approval stamp, dated and signed by the Contractor in every case, certifying that the Contractor has (a) reviewed, checked, and approved the submittal and coordinated submittal contents with all requirements of the Work and the Contract Documents including related Work, (b) determined and verified measurements, quantities, field construction criteria, materials and equipment including catalog numbers and identifications, and similar data, or will do so, and (c) states that the Work illustrated or described in the submittal is recommended by Contractor and that Contractor's warranty will fully apply thereto.

F. Corrections and Resubmittals: Contractor shall make corrections required by the Architect, resubmit corrected submittals until approved, direct attention in writing to all revisions other than corrections required on previous submittals, and state in writing all changes in costs for such revisions and assumption of all costs for revisions and related changes the same as required for deviations in Paragraph 1.02D, "Deviations".

G. Contractor's Check of Returned Submittals: Contractor shall check and review all submittals returned for correction and ascertain if required corrections result in extra cost above that included in the Contract, and shall give written notice to the Architect within 5 working days if, in Contractor's opinion, extra costs result from corrections. Contractor's failure to give such notice or starting of any Work covered by a returned submittal constitutes Contractor's waiver of claim for extra costs resulting from required corrections.

H. Review Of Submittals By Architect: Submittals will be reviewed with reasonable promptness, but only for conformance with the design concept of the Project and with information indicated on the Drawings or specified. Approval of a separate item as such will not constitute approval of the assembly in which the item functions. Approval of any submittal shall not relieve the Contractor of responsibility for any deviation from requirements of the Contract Documents or for any revision in resubmittals unless Contractor has given written notice of such deviation or revision at time of submission or resubmission and written approval has been given to the specific deviation or revision. Contractor shall be solely responsible for errors or omissions in all submittals and for all the costs resulting from all such errors or omissions including compensation for additional services of Architect and Architect's consultants and engineers made necessary thereby (which responsiblity of the Contractor shall survive termination of the Contract), whether or not the submittals are reviewed and approved by Architect, and be responsible for accuracy of dimensions and quantities, adequacy of connections, and the proper and acceptable fitting, execution, functioning, and completion of the Work.

I. Incomplete Or Inadequate Submittals: Submittals which are incomplete or inadequate, including any submittals not correctly transmitted, titled, and identified, or not bearing the Contractor's review and approval stamp, will be returned to the Contractor without review.

J. Interrelated Submittals: Unless preparation of any submittal information is dependent upon the approval of any prior submittal, all submittals pertaining to the same class or portion of the Work shall be submitted simultaneously.

K. Expense: All cost for the preparation, correction, delivery, and return of submittals shall be borne by the Contractor.

L. Delivery and Return: Deliver submittals to the Architect's office unless otherwise directed by the Architect. Contractor or an authorized representative shall obtain returned submittals at the Architect's office only; returned submittals will not be mailed or otherwise delivered to the Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SHOP DRAWINGS: Prepare each submittal complete including all dimensions, design criteria, materials, connections, bases, foundations, anchors, and the like, and further including such technical and

performance data as is necessary to confirm the information in the Shop Drawings. Prepare Shop Drawings of same size as the Drawings or on 8-1/2" by 11" 3-hole punched vellum sheets suitable for ozalid or xerox reproduction. Copies of the Contract Drawings marked to show Shop Drawing information are not acceptable. Each Shop Drawing shall have an adequate title block giving: (1) Name and address of the Work; (2) Name and address of Contractor; (3) Name and address of each Subcontractor, Sub-subcontractor, manufacturer, or supplier, as applicable; (4) Name and address of the Architect; (5) Date, scale of Shop Drawings, and identification number; and (6) Contractor's review and approval stamp, dated and signed. Show dimensions and identify which are based on field measurements; identify materials, products, and equipment, and show compliance with specified standards; identify any deviations from the Contract Documents; and show how the submittal contents are coordinated to the adjoining and related Work.

A. Initial and Resubmittals: Submit Shop Drawings in sets consisting of one sepia reproducible and two blue-line prints.

B. Correction and Approval of Shop Drawings: The Architect will mark notations, corrections, exceptions, or approval on submitted transparencies for return to the Contractor. Contractor shall resubmit in the same manner if Shop Drawings are not approved.

C. Architect's Review Comments: Architect's stamp and review and correction comments for submittals returned to the Contractor will have following meanings unless otherwise specified.

1. NO EXCEPTIONS TAKEN: Such notation means that the submittal is approved as submitted.

2. REVISE AND RESUBMIT: Such notation means the submittal is disapproved and Contractor shall revise the submittal to extent of the Architect's comments requiring such revision and shall resubmit the submittal. In no case shall review comments of the Architect be construed to allow deviations from or revisions to the submittal contents other than those included in the Architect's review comments; if the Contractor includes in a resubmission any deviations or revisions to the submittal contents not covered by Architect's review comments, the provisions of Paragraphs 1.02D and 1.02F above shall apply.

3. REQUIRED CORRECTIONS NOTED: Such notation means that the submittal is approved subject to the Contractor's correction of the submittal to the extent of Architect's review and correction comments, and resubmission is not required. In no case shall the eview comments and corrections required by the Architect be construed to allow deviations from or revisions to the submittal contents other than those included in the Architect's review and correction comments. If the Contractor makes any deviations or revisions to the submittal contents that are not covered by the Architect's review and correction comments, the provisions of Paragraphs 1.02D and 1.02F above shall apply, and in such case Contractor shall without further instruction resubmit the entire submittal including the required description of all such deviations or revisions and the reasons therefor in the transmittal; otherwise, the entire submittal shall be deemed and understood to be automatically disapproved and rejected by the Architect.

4. REJECTED: Such notation means that the entire submittal is disapproved and the Contractor shall prepare and submit an entirely new and different submittal in lieu of the rejected submittal.

D Final Distribution: The Contractor shall furnish and distribute prints of the approved Shop Drawings as required for performance of the Work.

3.02 SAMPLES: Unless otherwise specified, each Sample submittal shall include not less than two complete sets of Samples. One set of approved Samples and all disapproved Samples will be available for return to the Contractor. Any Samples of value retained by the Architect will be available for return to Contractor at completion of the Work if Contractor's first transmittal for the Sample requests its return. Approved Samples returned to Contractor may be installed in the Work if meeting all requirements of the Contract Documents, each location is recorded, and Samples bear temporary identification as such.

3.03 PRODUCT DATA SUBMITTALS: These submittals shall include complete lists of materials, catalog data and brochures, performance and technical data including characteristics, service history, and similar information to fully describe the products covered by the submittal.

A. Submittal Preparation: Bind each submittal copy with sturdy labeled cover and include typed index listing the contents. Loose unbound submittals will be returned unreviewed. For each item listed, include the manufacturer's name and address, trade or brand name, all conditions of the manufacturer's guarantee and warranty, information to fully describe each item, and supplementary information as may be required for approval. Mark cuts, brochures, and data to indicate the items proposed and intended use as required for transmittals in Paragraph 1.02C.

B. Product Data Submittal Procedure: Unless otherwise specified, the submittals shall consist of four bound copies; one copy will be returned to the Contractor marked to show required corrections or approval. If corrections or changes are required, the final submittal shall include four bound corrected or revised copies.

3.04 EQUIPMENT DATA SUBMITTALS: Equipment data submittals, including complete technical, performance, and catalog data, are required for every mechanical and electrical equipment item proposed for the Work, each submittal bound, indexed, and containing information and data as specified in Article 3.03, "Product Data Submittals". Each submittal shall include information covering performance and operating curves, ratings, capacities, characteristics, power efficiency, each manufacturers' standard guarantees and warranties with the terms and conditions fully described, and all other information to fully illustrate and describe the items as may be specified or required for approval. Submit in sets which cover complete systems or functioning units. Unless otherwise specified or directed, submit equipment data as specified above under Subparagraph 3.03B, "Product Data Submittal Procedure". Where applicable, include the approved equipment data in and submit with the manuals specified in Section 01770.

3.05 MANUFACTURERS' DETAILED INSTRUCTIONS: Submit the manufacturers' detailed preparation and installation instructions for various materials specified to be installed in accordance with such instructions to demonstrate the adequacy and completeness of the instructions. Furnish copies to all trades involved.

3.06 MATERIALS FURNISHED UNDER STANDARD SPECIFICATIONS: For various materials specified by reference to standard or reference type specifications, prepare and submit a list of such materials stating manufacturer's names and identifications to the extent requested by the Architect or Owner.

3.07 CERTIFICATES: Each certificate required by Contract Documents shall be signed by an officer, agent, or individual lawfully authorized to execute the certificate and such authority shall be cited in the certificate by description, title, or other acceptable evidence. Certificates shall be sworn and notarized as to correctness and validity of the contents, and all copies shall be notarized to be true copies. Deliver all certificates to the Architect.

END OF SECTION

SECTION 01410

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements for the regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.02 REQUIREMENTS OF REGULATORY AGENCIES: Pertaining statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction of the Work are hereby incorporated into these Contract Documents the same as if repeated in full herein and such are intended where any reference is made in either the singular or plural to Code or Building Code unless otherwise specified including, without limitation, those in the list below. Contractor shall make available at the site such copies of the listed documents applicable to the Work as the Architect or Owner may request including mentioned portions of the California Code of Regulations (CCR).

A. City of Los Angeles Municipal Code including the Building Code and Department of Building and Safety approvals for materials, equipment, systems, and designs as applicable to the Work.
B. Uniform Building Code, current Edition.
C. Title 8 CCR, Industrial Relations, including without limitation Chapter 4, Division of Industrial Safety, Safety Orders (CAL-0SHA).
D. Americans with Disabilities Act (ADA).
E. Title 19 CCR, Public Safety.
F. Title 22 CCR, Social Security.
G. Title 24 CCR, Building Standards including the architectural barrier laws and energy conservation standards.
H. City of Los Angeles Mechanical Code.
I. City of Los Angeles Plumbing Code.
J. City of Los Angeles Fire Code.
K. City of Los Angeles and State Elevator Codes.
L. City of Los Angeles and National Electrical Codes.
M. State and Local Public Health Codes.
N. Other statutes, ordinances, laws, regulations, rules, orders, and codes specified in other Sections of the Specifications or bearing on the Work.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01420

REFERENCES

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements for the reference standards pertaining to the Work and is supplementary to the reference standards mentioned or referenced elsewhere in the Contract Documents.

1.02 REFERENCE AND STANDARD TYPE SPECIFICATIONS: Specifying by reference to standard and reference type specification documents or to another portion of the Contract Documents shall be the same as if the referenced document or portion of the Contract Documents referred to were exactly repeated at the place where such reference is made. In case of a conflict between the requirements of regulatory agencies and referenced standard and reference type specification documents, Contractor shall conform to the most restrictive requirement if such conformance is legal. The reference or standard type specification documents shall be the current issue at the time Construction Documents Phase, defined in AIA Document B141, is completed unless otherwise specified. Contractor shall make available at the site such copies of reference or standard type specification documents as the Architect or Owner may request.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01425

ABBREVIATIONS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers abbreviations for documents mentioned or referenced elsewhere in the Contract Documents, and language abbreviations used in the text of the Specifications. Abbreviations in the Drawings and Specifications shall be interpreted according to recognized and well-known technical, industry, or trade meanings.

1.02 ORGANIZATION NAME ABBREVIATIONS: These abbreviations include but are not limited to the following:

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Traffic Officials
ACI	American Concrete Institute
ADA	Americans With Disabilities Act
ADC	Air Diffusion Council
AEI	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AFI	Air Filter Institute
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction, Inc.
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
CBM	Certified Ballast Manufacturers
CCR	California Code of Regulations
CDA	Copper Development Association
CGA	Compressed Gas Association
CISPI	Cast-Iron Soil Pipe Institute
CS	Commercial Standard, US Department of Commerce
CTI	Cooling Tower Institute
DEMA	Diesel Engine Manufacturers Association
DOD-	Department of Defense (leading symbol)
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories
FAA	Federal Aviation Administration

Organization Name Abbreviations - Continued

FCC	Federal Communications Commission
FIA	Factory Insurance Association
FM	Factory Mutual
HI	Hydraulic Institute
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
ISO	International Standards Organization
MIL-	Military Specification or Standard (leading symbol)
MSS	Manufacturers Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NAFM	National Association of Fan Manufacturers
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFC	National Fire Code
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
PDI	Plumbing and Drainage Institute
PS	Product Standard, US Department of Commerce
REA	Rural Electrification Administration
RIS	Redwood Inspection Service
SAE	Society of Automotive Engineers
SFM	State Fire Marshal
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

1.03 TEXT ABBREVIATIONS: Text abbreviations include but are not limited to the following:

AMP or amp	Ampere
CFM or cfm	Cubic feet per minute
CY or cy	Cubic yard
FPM or fpm	Feet per minute
FPS or fps	Feet per second
GPM or gpm	Gallons per minute
Kip or kip	Thousand pounds
Ksi or ksi	Thousand pounds per square inch
Ksf or ksf	Thousand pounds per square foot
KV or kv	Kilovolt
KVA or kva	Kilovolt amperes
KW or kw	Kilowatt
KWH or kwh	Kilowatt hour
LF or lf	Linear foot
MPH or mph	Miles per hour

Text Abbreviations - Continued

PCF or pcf	Pounds per cubic foot
PSF or psf	Pounds per square foot
PSI or psi	Pounds per square inch
SF or sf	Square foot
SY or sy	Square yard
PSY or psy	Per square yard
'	Feet or Foot (as in 5'-0")
"	Inch (as in 5'-0")
°	Degree (temperature or angle)

PART 2 – PRODUCTS (Not applicable to this Section)

PART 3 - EXECUTION (Not applicable to this Section)

END OF SECTION

SECTION 01426

DEFINITIONS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the definitions supplementary to those given in the Conditions of the Contract.

1.02 DEFINITIONS:

A. References to Drawings: Words such as "shown", "indicated", "detailed", "scheduled", "noted", and words of similar import shall mean that reference is made to the information on the Drawings unless stated otherwise.

B. Actions of Architect: Such words as "directed", "designated", "selected", and words of similar import shall mean the direction, designation, selection, or similar action of the Architect is intended unless stated otherwise.

C. Required: The word "required" and words of similar import shall mean "as required to complete the Work" and "required by the Architect", as is applicable to the context of the place where used, unless stated otherwise.

D. Perform: The word "perform" shall mean that Contractor, at Contractor's expense, shall perform all the operations necessary to complete the Work or the mentioned portions of the Work, including furnishing and installing materials as are indicated, specified, or required to complete such performance.

E. Provide: The word "provide" shall mean that Contractor, at Contractor's expense, shall furnish and install the Work and mentioned portion of the Work, complete in place and ready for the intended use. This definition applies the same to future, present, and past tenses except "provided" may mean "contingent upon" where such is the context.

F. Complete: The word "complete" shall mean that Contractor, at Contractor's expense, shall furnish and install the Work and mentioned portion of the Work, complete in place, ready for the intended use, and conforming to requirements of the Contract Documents, including all ancillary labor and materials required for such completion.

G. Equal: Words such as "equal", "approved equal", "equivalent", and terms of similar import shall be understood to be followed by the phrase "in opinion of the Architect" unless stated otherwise.

H. Approval: The words "approved", "approval", and words of similar import shall mean that approval of the Architect, or similar import, is intended unless stated otherwise.

I. Acceptance: The words "acceptable", "acceptance", and words of similar import shall mean that approval or acceptance of the Owner, or similar import, is intended unless stated otherwise.

J. Submit: The words "submit", "submittal", "submission", and other terms of like import shall include the meaning of the phrase "submit to the Architect for approval" unless otherwise stated.

K. Expense: Such phrases as "at Contractor's expense", "at no extra cost to Owner", "with no extra compensation to Contractor", or phrases of similar import shall mean that Contractor shall perform or provide the operation or Work with no increase to the Contract Sum stated in the Agreement.

L. By Others: Wherever the phrase "by others", or phrases of similar import, occurs on the Drawings or in the Specifications, the intent is to mean that the mentioned or involved portion of the Work, or described operation for the Work, so identified is be performed or provided by other Subcontractor(s) or by other trade(s), or by Contractor's forces; however, in all cases the Work or operation so identified by the phrase is a part of the complete Work to be provided by the Contractor and forms a part of the Work and Contractor's responsibilities under the Contract Documents unless specifically otherwise defined, indicated, noted, or specified elsewhere in the Contract Documents.

M. Fees and Charges: To the extent indicated or specified, Contractor shall secure permits, governmental authorizations, licenses, inspections, and all similar requirements and pay all costs relating thereto no matter how such costs are defined by the political subdivision, public authorities or agencies, public or private utilities, telephone companies, quasi-governmental entities, special and service districts, or other agencies involved.

N. Language: Specifications are written in a modified brief style consistent with clarity. Such words as "the", "shall", "will", and "all" are generally not used. Words and phrases requiring an action or performance, such as "perform", "provide", "erect", "install", "furnish", "connect", "test", "coordinate", and words and phrases of similar import shall be understood to be preceded by the phrase "The Contractor shall" unless otherwise stated. The requirements indicated and specified apply to all Work of the same kind, class, and type, even if the word "all" is not stated.

O. Titling and Arrangement: The titles of Articles, Paragraphs, and Subparagraphs and other identifications of subject matter in the Specifications are intended only as an aid in locating and recognizing the various requirements in the Specifications. Except where titling forms part of the text, such as beginning words of a sentence or where the title establishes the subject, titles are subordinate to and do not define, limit, or restrict the Specification text. Underlining or capitalizing of words in the text does not signify or mean that such words convey special or unique meanings having precedence over any other part of the Contract Documents. Specification text shall govern over titling and shall be understood to be and interpreted as a whole. The listings of various parts of Work to be included or not included under various Sections of the Specifications are for convenience only and do not control the Contractor in dividing the Work among the Subcontractors or establish the extent of the Work to be performed or provided by any Subcontractor or trade. Contractor is solely responsible for providing the complete Work without respect to where or how the various parts of the Work may be indicated or specified. The sequence of Articles, Paragraphs, Subparagraphs, and Sub-subparagraphs in the Specifications text is defined by the sequence 1.01A.1.a.(1)(a).

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 01430

QUALITY ASSURANCE

PART 1 - GENERAL

1.01 SUMMARY: The Contractor is responsible for establishing and implementing a Quality Assurance program that ensures timely and cost-effective completion of the Work.

1.02 STATEMENT OF AGREEMENT: Contract Documents have been checked by the Architect and, to the best of Architect's knowledge and belief, are reasonably free from errors, omissions, conflicts, inconsistencies, code violations, and improper use of materials. To identify any problems which may remain in the Contract Documents, and to expedite their resolution, the Contractor shall follow the procedures described herein.

A. Contractor's Examination: The Contractor shall carefully study and compare all the Contract Documents and at once report to the Architect in writing any error, omission, conflict, inconsistency, or code violation the Contractor may discover.

B. Subcontractor Examination: The Contractor shall require that each Subcontractor read and comply with requirements of this Section, study and compare those Specification Sections which cover the Work of each Subcontractor, and report to Contractor in writing any error, omission, conflict, inconsistency, or code violation any Subcontractor may discover.

C. Non-Responsibility: Compliance with the requirements herein does not obligate the Contractor, or any Subcontractor, to correct the problems which are so identified without written instructions from the Owner or Architect.

D. Statements: Before awarding any subcontract, or starting any Work with Contractor's own forces the Contractor, and each Subcontractor through the Contractor, shall complete and submit to the Owner a Statement of Agreement as specified herein. The Statement of Agreement is included in this Section for information, reproduction, and distribution by the Contractor. Complete the item entitled "Exceptions" by indicating "No Exceptions", or list exceptions together with any errors, omissions, conflicts, inconsistencies, code violations, improper use of materials, usage of materials contrary to the involved manufacturer's instructions or usage that voids the manufacturer's guarantee or warranty, discovered in the Contract Documents.

E. Resolution of Exceptions: Contractor shall resolve all exceptions which are identified as described above with the Owner and Architect before awarding applicable subcontracts. If any of the completed Statements of Agreement identify conflicts or conditions which interfere with structural integrity, function, or architectural appearance of the Work, and which cannot be resolved without additional cost to the Contractor, the Contractor shall inform the Owner in writing. Any Work involving identified exceptions performed prior to receipt of instructions from the Owner will be done at Contractor's risk.

F. Delivery: All Statements of Agreement required herein shall be delivered to the Owner before execution of the Owner-Contractor Agreement.

(Section Continues)

STATEMENT OF AGREEMENT

Undersigned acknowledges that, in the process of preparing a bid for referenced category of Work, undersigned has examined the Drawings; read and understands requirements of General and Supplementary Conditions; Addenda, if any; technical Sections of the Specifications describing Work categories for which undersigned is directly responsible, and all those related Sections which include additional requirements for cooperation, coordination, and compliance.

Undersigned acknowledges the obligation to identify below any errors, omissions, conflicts, code violations, and improper use of materials, including usage that is contrary to manufacturers' instructions or voids manufacturer's guarantee or warranty, discovered in Contract Documents that could interfere with the timely completion of the Work, or increase the cost of that category of Work for which the undersigned is responsible.

Except as noted below, undersigned has no objection to or reservation about the materials to be furnished or conditions under which they will be installed; and is satisfied that the undersigned can fully complete the applicable contractual responsibilities in a workmanlike manner without extensive modifications to the Work or additional expense.

CATEGORY OF WORK: _____

SPECIFICATION SECTION(S): _____

EXCEPTIONS: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

SUBMITTED BY: _____

SIGNED BY: _____ DATE: _____

END OF SECTION

SECTION 01450

QUALITY CONTROL

PART 1 - GENERAL

1.01 SUMMARY: This Section covers general requirements for quality control of the Work, including testing and inspection procedures.

A. Requirements In This Section:

1. Testing laboratory or agency.
2. Soils Engineer.
3. Coordination of tests and inspections.
4. Test costs and reports.
5. Inspections, continuous and special, and inspection costs.
6. Contractor-furnished assistance.
7. Verification of conditions.

B. Requirements Specified Elsewhere:

1. Specific test procedures to be performed in accordance with this Section.
2. Testing of mechanical and electrical systems, and conveying systems.
3. Testing of materials specified to be tested by other agencies under other Sections.

1.02 GENERAL QUALITY CONTROL REQUIREMENTS: Materials to be furnished under the Contract are subject to testing and inspection for compliance with the requirements of the Contract Documents.

B. Testing Laboratory: The licensed Testing Laboratory certified as meeting requirements of ASTM D3666, D3740, E329, E543, and E548, as applicable to Work involved and approved by Owner, referred to hereafter as Testing Laboratory. Perform all testing under the supervision and control of a registered civil engineer employed by the Testing Laboratory and registered in the State where the Work is located.

C. Soils Engineer: The registered professional Geotechnical, Foundation, or Soils Engineer employed and paid by the Owner and hereafter referred to as the Soils Engineer.

D. Disqualified Material: Any material shipped or delivered to the site by Contractor from the source of supply prior to having satisfactorily passed required testing and inspection, or prior to the receipt of a notice from the Architect that such testing and inspection will not be required, shall not be incorporated in the Work.

1.03 COORDINATION OF TESTS AND INSPECTIONS: The Contractor shall initiate and coordinate testing and inspections required by the Contract Documents and public authorities having jurisdiction of the Work.

A. Notification: Contractor shall notify Owner a sufficient time in advance of manufacture of material to be supplied by Contractor which, by requirements of Contract Documents, must be specially tested at the source of supply or the factory (excluding standard factory tests) in order that Owner may arrange for testing.

1.04 TEST SAMPLES: Furnish and deliver Samples of materials to be tested at no extra cost to Owner. Test samples will be selected by the Architect, Inspector, or Testing Laboratory and not by the Contractor.

1.05 TEST PROCEDURES: Testing Laboratory shall perform tests according to ASTM or other methods of test specified for various materials in other Sections. If no procedure or test method is specified, testing shall conform to the material specification referenced except as otherwise directed. Testing Laboratory shall tag, seal, label, record, or otherwise adequately identify materials for testing and no such materials shall be used or

installed in the Work until test result reports are submitted and approved, excepting only those materials specified to be placed or installed prior to testing. Repeat applicable tests at specified intervals, whenever source of supply is changed, or whenever the characteristics of materials change or vary in the opinion of Owner or Architect.

1.06 TEST COSTS: The Owner will pay for tests performed by the Testing Laboratory except Contractor shall reimburse Owner for retesting costs caused by failure of materials to pass initial tests. Contractor shall arrange and pay for all other testing.

1.07 TEST REPORTS: Furnish and deliver copies of each test report, signed and certified by Testing Laboratory supervising engineer, as follows:

	Copies:
Owner	1
Architect	2
Structural Engineer (structural tests only)	1
Contractor	2
Building Department	1

1.08 INSPECTIONS, CONTINUOUS AND SPECIAL:

A. Inspections: Continuous and special inspections shall be performed by Registered Deputy or Special Inspectors (hereafter referred to as Inspector) as required by the Contract Documents and Building Code. During course of Work under inspection, each Inspector shall submit detailed reports relative to the progress and condition of the Work including variances from Contract Documents, and stipulating dates, hours, and locations of the inspections.

B. Inspection Costs: The Owner will employ the Inspector and pay for continuous and special inspections.

C. Reimbursement of Inspection Cost: Contractor shall reimburse to the Owner all or any part, as the Owner may deem just and proper, of the actual excessive inspection costs incurred by the Owner due to any or all of the following:

1. Contractor's failure to complete entire Work within the Contract Time stated in the Agreement, and any previously authorized extensions thereof.
2. Claims between separate contractors.
3. Covering of Work before required inspections or tests are performed.
4. Extra inspections for Contractor's correction of defective Work.
5. Overtime costs for acceleration of Work for Contractor's convenience.

D. Approvals Required by Others: If the laws, ordinances, rules, regulations or orders of any public agency having jurisdiction require any of the Work to be specifically inspected, tested, or approved by some authority other than Owner, Architect, or Contractor, the Contractor shall give required notices, make all arrangements, deliver to Architect certificates of inspection, testing, or approval of such authority, and pay all costs therefor unless otherwise provided in the Contract Documents.

1.09 CONTRACTOR-FURNISHED ASSISTANCE: When requested, Contractor shall furnish access, facilities, and labor assistance as necessary for the duties to be performed at the site by Testing Laboratory and Inspector including furnishing ladders, hoisting, temporary lighting, water supply, hoses, and like services.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01455

MOCK-UP REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the mock-up and laboratory performance testing requirements and procedures for the designated portions of the Work.

A. Work Included:

1. Shop Drawings and structural calculations for mock-ups.
2. Test procedures for mock-ups.
3. Test reporting.

B. Related Work:

1. Permanent construction at the site.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Obtain preliminary approval of submittals by the Architect, excluding the structural calculations, prior to starting installation of a mock-up test unit.

A. Mock-Up Shop Drawings: Submit detail Shop Drawings fr each mock-up.

B. Calculations: With Shop Drawings, submit structural calculations for each mock-up unit, coordinated with Shop Drawings and prepared and sealed by a California registered structural engineer, submitted for information only and not for review or approval.

C. Revisions: Following completion of mock-up testing procedures, revise Shop Drawings and structural calculations to reflect all changes made to the mock-up construction required to satisfactorily meet the testing procedure criteria.

D. Record Drawings: Submit the revised Shop Drawings as Record Shop Drawings in accordance with requirements specified for Record Drawings in Section 01770, and copies of revised structural calculations, for the Owner's record purposes with the Summary Test Report specified hereinafter. Include in the Record Shop Drawings the actual dimensions and thicknesses of all mock-up component parts.

1.02 QUALITY ASSURANCE:

A. Intention: It is intended that the requirements specified herein will allow an evaluation to be made by the Owner and Architect of mock-up quality and appearance.

B. Test Agency and Reports: The Test Agency must be acceptable to the governing Building Department. Testing shall be conducted by an AAMA certified testing agency approved by the Architect and Owner and under the supervision of a California registered engineer. The Contractor shall employ an approved qualified independent Test Agency to perform required laboratory testing and report test results, and shall pay all Test Agency costs and charges for testing of all mock-ups. Also, the Contractor shall pay the travel and subsistence expenses incurred by the Owner and Architect, and their authorized representatives, in attending the tests if the Testing Agency is located outside the Greater Los Angeles area (i.e., more than 60 miles from the Project site).

C. Test Reports: Deliver to the Architect copies of the certified test reports specified hereinafter, each report certified by the Test Agency supervising engineer or by the witnessing independent registered engineer.

D. Contractor's Responsibilities: The Contractor shall be responsible for scheduling, mock-up construction, necessary revisions, and disposal.

E. Mock-Up Record Shop Drawings: Keep reference copies of all the interim mock-up record drawings available at the laboratory during the tests.

F. Observation: Before commencing the tests, original mock-ups will be visually evaluated by the Owner and the Architect.

PART 2 - PRODUCTS

2.01 MATERIALS: All materials used to construct the mock-ups shall conform to the submittals approved under the Sections involved, and shall have the finishes specified including paint finishes.

PART 3 - EXECUTION

3.01 CRITERIA:

A. Design Pressure: Determine the design pressure in accordance with the Uniform Building Code, 2000 Edition, except minimum design pressure shall be 20 psf where the UBC allows a lesser pressure.

B. Seismic Displacement: Displacement shall be the "story drift" required by the Uniform Building Code, 2000 Edition.

3.02 GENERAL TESTING REQUIREMENTS: Conform to following general requirements.

A. General Mock-Up Requirements: Construct the mock-up test units of previously approved components including, without limitation, applicable glazing, sealants, anchor assemblies, etc. Include the following.

1. Mock-Up Test Chamber
2. Test Instrumentation
3. Photographs

3.03 TEST METHODS: Test performance characteristics of the mock-up test units using static and dynamic methods in conformance with the applicable test methods of the ASTM and AAMA for air infiltration, static water infiltration, dynamic water infiltration, and structural performance.

3.04 TESTING PROCEDURES: Unless approved otherwise in the required submittals, perform mock-up tests in sequence and as described in approved submittals. Include destruction tests. Submit preliminary test report prepared by the Test Agency supervising engineer describing the mock-up tested, the test procedures performed, and results of each testing procedure

3.05 FINAL TEST REPORTS: Upon successful completion of all tests, the Test Agency shall furnish to the Architect in a timely manner five copies of a certified Summary Test Report prepared in accordance with the test standards and certified by the supervising engineer or the witnessing professional engineer.

A. Site Construction: The Contractor shall proceed with the manufacture and production of site installation materials only after the Owner's and Architect's review of both Preliminary Test Reports and Summary Test Report, the Record Shop Drawings showing revisions resulting from all test failures, and the record structural calculations, documentation, and certifications.

3.06 DISPOSAL: After the completion of testing, all mock-up test assemblies and components shall be the property of the Contractor. No mock-up test components shall be installed in the Work at the building site.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers general requirements for construction facilities and temporary controls for the Work.

A. Work In This Section: Principal items include:

1. Temporary barricades.
2. Temporary storage facilities.
3. Temporary offices and telephones.
4. Construction project sign.
5. Temporary heat and ventilation.
6. Removal of temporary facilities.

1.02 GENERAL: Drawings indicate building site and related areas of the Owner's property available for the Work. Keep areas orderly, free of hazards, and leave in clean condition acceptable to Architect, Owner, and public authorities.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 DESIGNED BARRICADES: To extent shown or required by Code, construct solid barricades complete with canopies, railings, guards, night and warning lighting, warning signs and directions, and other features designed by the Architect. Paint surfaces exposed to public view with two coats of paint in Architect-designated colors and patterns. Secure and pay for the building and street use permits and inspections required by law.

A. Standard Site Barricades: Construct solid barricades, chain link fencing, or other type of Code approved barricades to the extent required by Code except where designed barricades are indicated or required.

3.02 TEMPORARY STORAGE FACILITIES: Provide such temporary storage facilities as are necessary.

3.03 OFFICES AND TELEPHONES: Provide office space on site as required. Provide an approved separate office for the Owner, Architect, and Inspector of the same type, equipped as approved, and a non-pay telephone with loud exterior bell for business use without charge. The offices, equipment, and furniture shall remain the property of the Contractor.

3.04 PROJECT SIGN: Exterior grade Douglas fir plywood face with a rigid frame, having painted background and lettered name of the Work and names of the Owner, Architect, and Contractor, all in accordance with sketches prepared by the Architect. Obtain and pay for building permit for sign, if required by law.

3.05 TOILET FACILITIES: Install temporary toilets for workers. Maintain in a clean and sanitary condition. Locate as approved and connect to existing sewers when feasible. Chemical toilets may be used if approved by governing Code.

3.06 UTILITY SERVICES: Issue the proper notices, make necessary arrangements, furnish labor and provide materials required for the care and maintenance of all public utilities, and assume responsibility concerning the same for which the Owner may be liable. Do all necessary enclosing or boxing in for the protection of public utilities. Upon completion of the Work, remove the enclosures, fill in openings in concrete or masonry with like materials, grout watertight, and leave in finished condition.

A. Water: Furnish and pay for all water required for the Work.

B. Lighting and Electrical Power: Furnish and pay for electric service and power required for the Work. Pay charges and fees for making and removal of the temporary service connections. Provide temporary lighting required for performance of the Work.

C. Natural Gas: Furnish and pay for natural gas required for the Work.

3.07 TEMPORARY HEAT: Furnish and pay for heat, fuel, and services to protect the Work against injury from dampness and cold until final acceptance.

A. Ventilation: Furnish and operate ventilation fans or equivalent equipment discharging to the exterior as required to ensure drying of materials installed in enclosed or below-grade building levels and spaces. Attention is directed to removal of moisture released from concrete and cementitious materials in such areas and spaces.

B. Filters: During the temporary heating and ventilating, equip air distribution systems with temporary throwaway filters to prevent dust entering air supply and return systems. Be responsible for delivering the air systems free of dust and lint at time of final acceptance of the Work.

3.08 REMOVAL AND RESTORATION: Remove construction facilities and temporary controls, and all other construction of temporary nature, from the building and construction site as soon as progress of Work permits. Without limitation, items to be removed include temporary barricades of any kind, project sign, and temporary utility services. Before Substantial Completion of the Work, recondition and restore all portions of the site and building occupied by temporary construction facilities and controls to acceptable condition.

END OF SECTION

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements for materials and equipment for the Work. Specific requirements for materials and equipment are covered under other Sections of the Project Manual.

A. Requirements In This Section:

1. Submittals for factory finish colors.
2. Materials, including:
   a. Equal and optional materials.
   b. Plurality of terms.
   c. Factory finish colors and exposed air distribution devices.
3. Transporting, handling, storage, and protection.

1.02 SUBMITTALS: Refer to Section 01330. Whether or not shown or specified elsewhere, submit color, gloss, and texture Samples for those materials specified to have a factory finish for selection and approval.

PART 2 - PRODUCTS

2.01 MATERIALS: Provide new materials and equipment unless otherwise shown or specified.

A. Equals: Those materials, products, and equipment specified by name of the manufacturer, brand name, model, type, or by similar proprietary identification are those which are to be provided for the Work, and proposed "equals" will not be considered. For the materials, products, and equipment specified to conform to requirements of a "Reference Standard" (such as ASTM, ANSI, NEMA, UL, etc.), Contractor may provide any material, product, or equipment item that conforms to the Reference Standard as evidenced by manufacturer's data, label, test reports, and like data, but subject to all other requirements indicated and specified.

B. Optional Materials: Where any material, product, or equipment item is specified by more than one proprietary or brand name, the Contractor may provide any one of the material or equipment items so specified. Before placing orders, advise the Architect in writing of each named material, appliance, or equipment item proposed and its intended use. Provide only one brand, kind, or make of material or equipment for each purpose throughout the Work not withstanding that similar material or equipment of two or more manufacturers may be specified for the same purpose.

C. Plurality of Terms: For materials, products, or equipment referred to by singular number, it is intended, unless otherwise limited, that such references apply to as much or as many material, product, or equipment items as are needed to complete the Work.

D. Factory Finish Colors: Colors of materials specified to be furnished with factory finish are subject to Architect's approval. If the available colors are not approved, modify the factory finish color to conform to the Architect's color instructions or provide another manufacturer's approved product which has an acceptable finish color, at no extra cost to the Owner.

E. Exposed Air Distribution Devices: Unless otherwise shown, specified, required, or directed, finished color of wall and ceiling air inlets and outlets (diffusers, grilles, air bars, etc.) shall match finish color of adjoining surface. Factory finish colors that conform to this requirement are acceptable, subject to the requirements of Paragraph 2.01D above. If acceptable color match is not obtainable with available factory finishes, Contractor shall repaint the air distribution devices as required or furnish devices with factory prime coat finish for shop painting using enamel of approved gloss applied by electrostatic spray process and baked on. This color match requirement does not apply to air distribution devices indicated or specified to have a natural

metal or anodized finish, but supersedes any conflicting requirements shown or specified. Perform such painting or repainting at no extra cost to the Owner.

PART 3 - EXECUTION

3.01 TRANSPORTING AND HANDLING: Transport and all handle materials, products, and equipment by methods that prevent damage, defacing, or overstressing. Lift the equipment, machinery, and heavy fabricated products only at the lifting points designated by the manufacturer or, if not so designated, at the points or along the members designed to support the items when installed. Contractor shall bear all loss that may result from transporting and handling materials, products, and equipment and shall provide approved replacements for damaged or defective items at no extra cost to the Owner. Conform all transporting and handling procedures to Title 8, CCR, as applicable.

3.02 STORAGE AND PROTECTION: Materials, products and equipment items designed for permanent weather exposure may be temporarily stored off the ground without additional protective covering provided equipment closures and seals are intact. Store other materials, products, and equipment items off the ground in dry, covered, weather-protected storage facilities. Exercise special care to protect moisture-sensitive materials and materials damaged by light (ultraviolet) or heat. Arrange for adequate ventilation under protective coverings to prevent condensation.

END OF SECTION

SECTION 01630

PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY: This Section covers general requirements pertaining to product substitution procedures. Submittals required for proposed substitutions shall conform to Section 01330.

1.02 PROPOSED SUBSTITUTION PROCEDURES:

A. Prior to Receipt of Bids: Submit proposed substitutions to the Architect not less than 10 working days prior to Bid Date. The Architect may require submission of Drawings, Product Data, Samples, and other information in approved form for consideration of any proposed substitutions. All Bidders will be notified of approved substitutions.

B. After Award of Contract: Submit proposed substitutions to the Architect within 35 days after the date a Notice to Proceed is issued or the Agreement is executed, whichever is the earlier. Submit all proposed substitutions relating to a particular Subcontract or trade at one time on the specified Substitution Request Form listing proposed items to be substituted for indicated or specified items, and the stating amounts for variations in costs. Include Shop Drawings, Product Data, Samples, and other information to the extent requested by the Architect. After said time period, proposed substitutions will not be considered unless a specified product is no longer available for causes beyond control of the Contractor, and the Contractor verifies this fact and furnishes complete evidence thereof satisfactory to the Owner and Architect, or a change in the governing regulatory requirements makes a revision in design or material usage mandatory.

C. Approval or Rejection: Approval or rejection of proposed substitutions is at the Owner's sole discretion. The Owner's judgment will be final and the Owner will include consideration of following factors among others in comparing the equality of proposed substitutions with the requirements shown or specified: (1) Quality of materials, structural strength, construction, fabrication, and performance and function, mechanically and technically; (2) Appearance and finish, or surface characteristics permitting required finish to be applied; (3) If proposed substitutions require altering arrangement of adjoining or related Work, resulting arrangements must be equal in convenience, practicality, and appearance to the original arrangement; (4) Products equal in quality and utility are usually competitive products and nominally equal in price. If approval is requested for materials or equipment more economical than the specified products, the Owner may require the specified products with no increase to the Contract Sum; (5) An inequality in the availability of replacement parts or in maintenance services may be a determining factor, and; (6) Code approvals and service history.

D. Resubmission of Proposed Substitutions: Do not resubmit previously rejected proposed substitutions in modified form. Upon rejection of a proposed substitution, the Bidder may submit another proposed substitution within time limits stated above. If the second proposed substitution is rejected or not received by the Architect within the specified time, provide only indicated and specified Work at no additional cost to the Owner.

E. Compliance: Use of approved substitutions does not relieve the Contractor from full compliance with the Contract Documents. The Contractor shall bear all extra expense resulting from approved substitutions where approved substitutions affect adjoining or related Work.

F. Unauthorized Substitutions: If substitute materials are installed without prior approval, remove all the unauthorized materials and install those indicated or specified, at no extra cost to the Owner.

1.03 SUBSTITUTION REQUEST FORM: Submit proposed substitutions on the following Substitution Request Form which may be duplicated for use. Attach additional pages and/or data as specified or required.

PARTS 2 AND 3 – PRODUCTS AND EXECUTION (Not Applicable to this Section)

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: LANGDON WILSON ARCHITECTS
1055 Wilshire Blvd., Suite 1500
Los Angeles, Calif. 90017

Project: FOX ENTERTAINMENT GROUP
NEW OFFICE BUILDING.
STUDIO AREA 1

SECTION PARAGRAPH SPECIFIED ITEM

_____ _____ _____

PROPOSED SUBSTITUTE: _____

Attach a complete description, designation, catalog or model number, Spec Data Sheet or equivalent, and all other technical data, including laboratory tests if applicable. Fill in blanks below:

1. Will substitution affect dimensions indicated on Drawings? _____

_____

2. Will substitution affect wiring, piping, ductwork, etc. on the Drawings?

_____

3. What effect will substitution have on other trades? _____

_____

4. Differences between proposed substitute and specified item? _____

_____

5. Reason for substitution? _____

6. Will the undersigned pay for Architectural/Engineering costs required to revise the Contract Drawings caused by this substitution? _____

7. Manufacturer's guarantees of specified items and proposed items are?

Same _____ Different (explain) _____

Submitted by:

_____
Firm

_____
Address

_____

_____

Date_____ Phone_____

REVIEW COMMENTS

_____Accepted _____Accepted as noted (See attached copy)

_____Not Accepted _____Received too late

By _____

Remarks _____

_____

_____

SECTION 01640

OWNER-FURNISHED PRODUCTS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers general requirements for Owner-furnished Contractor-installed materials or equipment, referred to herein collectively as OFCI items.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Obtain necessary information from Owner as to manufacturer, model, and type of each OFCI item to be furnished. Submit Shop Drawings showing dimensioned rough-in diagrams for each OFCI item requiring utility connections, dimensioned locations of backing plates required in walls and partitions, and details of connections to supports for all OFCI items.

1.03 CONDITIONS: In each case, Contractor is responsible for correct and properly located installation of the OFCI items in accordance with the various manufacturers' specifications and instructions.

A. Conflicts: If conflict occurs between the requirements for the OFCI items and actual field conditions, Contractor shall not install the affected items until the conflict is resolved. No extra payment will be made to the Contractor for correction of improper installation of OFCI items when reasonably adequate data and instructions for installation were furnished by the Owner or various OFCI item manufacturers.

B. Installation: Install OFCI items complete in every detail with each product accurately and correctly placed, connected, and tested.

C. Delivery: OFCI items will be delivered to the site. Contractor shall receive and unload OFCI items, place in covered storage or enclosed building, and be responsible therefor after delivery. OFCI items that are damaged, abused, lost, or stolen while in Contractor's custody and control or damaged or defaced during installation shall be repaired, replaced, or otherwise made good to the Owner's satisfaction at the Contractor's expense.

D. Inspection of Delivered OFCI Items: Within 10 working days after delivery of the OFCI items, the Contractor shall open and uncrate the items for inspection. The Owner's representative and Contractor shall inspect each item and maintain a written record of all damage, missing parts, and other defects disclosed, all of which will be made good by the Owner. After the inspection, Contractor shall be solely responsible for the OFCI items as specified above.

E. Templates: Templates furnished by various OFCI item manufacturer's shall be kept at the site for reference and stored readily available to both the Owner and Architect. Deviations from manufacturers' templates will not be approved.

F. Additional Information: Contractor may request and receive from Owner any necessary additional information, specifications, templates, and like items from any of the manufacturers of the OFCI items. The Contractor may request a manufacturer's representative to supervise installation of any OFCI item, but at no extra cost to the Owner.

PART 2 - PRODUCTS

2.01 OFCI EQUIPMENT: The list of OFCI items is shown on the Drawings. Contractor shall provide attachments, fittings, fasteners, connectors, and other ancillary materials required for the installations but not usually furnished by the OFCI item manufacturers, types as approved.

PART 3 - EXECUTION

3.01 INSTALLATION: Conform installation to each OFCI item manufacturer's specifications, templates, and information, including the necessary assembling of components or sub-assemblies.

3.02 TESTS: The Contractor shall operate and test each operable OFCI item when installed and connected. If malfunction occurs through no fault of the Contractor, the Owner will make the defect good; otherwise, the Contractor shall effect all the necessary corrections so the OFCI item operates properly and as intended, at the Contractor's expense.

END OF SECTION

SECTION 01710

EXAMINATION

PART 1 - GENERAL

1.01 SUMMARY: This Section covers general requirements for examination of Work in place and conditions, correction of unsatisfactory conditions, and manufacturer participation where specified.

1.02 VERIFICATION OF CONDITIONS:

A. Examination of Work In Place: Prior to installing any part of the Work, the installing Contractor, Subcontractor, or Sub-subcontractor of any tier shall inspect the Work in place to receive the Work to be installed and arrange for the correction of defects in the existing workmanship, material, or conditions that may adversely affect Work to be installed. Such inspections shall include test applications of materials to be installed as required to establish the correct condition of surfaces and substrates involved.

B. Acceptance of Conditions: Installation of products, materials, or equipment on, into, or connected to the Work in place is acceptance by the installing Contractor, Subcontractor, or Sub-subcontractor of any tier of such Work in place as being in proper condition to receive the products, materials, or equipment to be applied, installed, or connected and waiver of claim that the Work in place is defective as pertains to the warranty requirements, excluding unascertainable or concealed conditions.

1.03 MANUFACTURER PARTICIPATION: Where the Project Manual requires any product, material, or item of equipment to be installed or applied under the supervision or inspection of the material manufacturer or its representative, the manufacturer or its representative also shall inspect the Work in place and, if the Work in place is satisfactory to the manufacturer, issue a letter of approval of the existing conditions, surfaces, or substrates, as applicable, to the Architect and the Contractor; however, if such conditions, surfaces, or substrates are not satisfactory, the manufacturer or its representative shall issue a letter to Architect and Contractor fully detailing and describing the unsatisfactory conditions and corrections required. When all corrections so required are completed, manufacturer or its representative shall re-inspect the Work involved and, if satisfactory, issue the said letter of approval. The Contractor shall give timely notice to the involved manufacturers, make necessary arrangements for manufacturers' supervision or inspection, and verify the specified manufacturers' letters are issued.

PART 2 – PRODUCTS (Not Applicable to this Section)

PART 3 – EXECUTION (Not Applicable to this Section)

END OF SECTION

SECTION 01720

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the Contractor's responsibility for surveying, layout of the Work, and general engineering.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 LAYING OUT THE WORK: The Contractor shall employ a registered Civil Engineer or Land Surveyor (hereafter referred to as Surveyor) to lay out the entire Work and set grades, lines, levels, and positions throughout the site. Before beginning the Work, locate all general reference points, establish permanent monuments, and take action as necessary to prevent their destruction; then lay out all lines, elevations, and measurements for entire Work including buildings, grading, paving, utilities, and other Work. Verify the figures and dimensions indicated on the Drawings and accept responsibility for errors resulting from failure to so verify. Establish permanent monuments on curbs, manholes, or pavements, or with concrete embedded steel pipe with lead plug and brass nail, as approved. Show exact locations and elevations of the permanent monuments on the Record Drawings. The Contractor shall be responsible to confirm all field plan conditions. Deviations in documented field conditions will be confirmed by the Architect and an appropriate Modification will be issued.

3.02 VERIFICATION SURVEYS: Attention is directed to other Sections of the Project Manual which require verification or measurement of installed Work by surveys or similar operations. The Surveyor shall perform and certify all such verification surveys or measuring at the Contractor's expense.

END OF SECTION

SECTION 01730

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements for cutting and patching procedures for new Work and is complementary to similar requirements indicated or specified elsewhere.

1.02 PROJECT/SITE CONDITIONS: Install protection for other Work against dust, dirt, weather, and damage during the cutting and patching procedures. Use care to protect floor surfaces and coverings from damage.

A. Welding: Conform to the following requirements where welding is performed on construction in place; conform to Title 8, CCR. Maintain a fully charged UL-labeled minimum 10 pound ABC fire extinguisher at every location where welding is performed on the construction in place.

1. Welding Smoke Control: Perform welding operations in the buildings by methods that produce the minimum feasible smoke and fumes. Furnish portable type smoke collection and ventilating equipment as required to prevent smoke and fumes from damaging other Work or creating a hazard.

2. Fire Prevention: Before welding, examine construction and backing for combustible materials and finishes and for any conditions where heat conduction in metals may bring the adjoining materials to ignition temperature. Use positive fire prevention measures including temporary removal and reinstallation of any combustible materials, temporary shields and/or heat sinks, and all other necessary means. When actual field conditions are such that positive fire prevention measures cannot be achieved, notify the Architect and do not proceed with the involved Work until receipt of the Architect's instructions.

B. Shoring and Bracing: Provide supports, shoring, and bracing required to preserve the structural integrity and prevent collapse of existing construction cut into as a part of cutting and patching operations. Do not cut or alter structural members without prior written approval of the Architect or Structural Engineer.

C. Overloading: Do not overload any part of the structures beyond the safe carrying capacity by placing of materials, equipment, tools, machinery, or any other item thereon.

PART 2 – PRODUCTS (Not applicable to this Section)

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING: Perform cutting to extent required by methods which prevent damage to Work to remain. Restore and refinish all new construction and finishes that are cut into to match adjoining Work and finishes unless otherwise indicated, specified, directed, or required. Conform the workmanship and materials used for restorations and refinishing to the applicable requirements of the related Sections of the Project Manual. Provide new fasteners, connectors, adhesives, and all other accessory materials required to fully complete approved reinstallations and restorations. Where the restorations and refinishing are defective or are otherwise not acceptable to the Owner or Architect, remove the defective and rejected materials and provide new acceptable materials and finishes at no extra cost to the Owner.

3.02 CLEANING AND DISPOSAL: Conform to Section 01740. Legally dispose of all removed material off the Owner's property except existing items to be salvaged or reinstalled. Promptly remove waste and debris and do not accumulate within facilities or on the site.

END OF SECTION

SECTION 01740

CLEANING

PART 1 - GENERAL

1.01 SUMMARY: This Section covers the general requirements for cleaning up during the Work and for final cleaning.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 CLEAN UP AND DISPOSAL: Requirements herein are part of all other Sections of the Project Manual and shall be coordinated with such additional clean up and disposal requirements specified in other Sections.

A. General: Leave the entire Work broom clean except where vacuum clean or another condition is indicated or specified. Where Work in place is damaged, defaced, stained, or otherwise defective and cleaning does not eliminate the defective condition, the Contractor shall remove the defective Work and provide new conforming Work as directed and approved, at no extra cost to the Owner.

1. Control During Work: Take care to avoid spread of dust, dirt, debris, water, paint, cement, sprayed materials, and other substances about the site or to adjacent property. Clean up splatterings or spills of materials at the time of occurrence. Remove dirt, debris, waste, and rubbish frequently, and do not allow it to accumulate in the structure or on the site. Do not store flammable or toxic materials in the structure.

2. Contractor's Supervision: Inform all trades and workmen of cleaning up requirements specified, and monitor where Work is in progress to ensure full compliance with all clean up requirements in all Sections.

3. Architect's Inspection: Give the Architect at least 3 working days advance notice of readiness for inspection as each phase or area of the Work is completed for occupancy. Correct deficient cleaning operations as determined and directed by Architect.

B. Final Clean Up - Exterior: Clean all surfaces of construction and site including fixtures, walls, soffits, floors, hardware, roofs, window sills and opening ledges, horizontal projections, steps and platforms, walkways, rails, and all like surfaces, and adjoining private and public property to extent soiled by Contractor's operations.

C. Final Clean Up - Interior: Leave surfaces in vacuum clean condition with dust, dirt, stains, handmarks, paint spots, droppings, and all other blemishes and defects completely removed.

D. Glass: Wash and polish all vision glass both sides, free of dirt, spots, streaks, and labels. Remove labels and clean and polish mirrors.

3.02 CONTAMINATED EARTH: Final clean up includes removal and disposal of earth that is contaminated or unsuitable for support of plant life in planting areas, and filling of resulting excavations with suitable approved soil as directed and approved.

3.03 DISPOSAL: Do not dispose of any rubbish, debris, waste material, oil, toxic substances, or any other material or substance which is banned by law from being disposed of in fills or backfills, all of which shall be removed from the Owner's property to a lawful disposal area. The Contractor shall pay hauling and dumping fees and charges. Conform disposal operations to Federal, State, and local laws, ordinances, rules, regulations, and orders pertaining.

END OF SECTION

SECTION 01770

CLOSEOUT PROCEDURES AND SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY: This Section covers general requirements for closeout procedures and submittals.

A. Section Includes:

1. Record Drawings.
2. Record Project Manual.
3. Operation and maintenance manuals.
4. Maintenance materials.

1.02 SUBMITTALS: Conform all submittals under this Section to Article "General Submittal Requirements" of Section 01330.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 RECORD DRAWINGS:

A. Record Set During The Work: At the site maintain not less than one set of the Drawings as a Field Record Set; furnish copies to various Subcontractors for recording of their portions of the Work. Also maintain not less than one copy of Addenda, Modifications, approved submittals, correspondence, and transmittals at the site. Keep the Field Record Set of the Drawings and data in good order and readily available to the Architect, Owner, and their representatives. Keep the Field Record Set of Drawings separate from all other documents and do not use the Field Record Set of Drawings for any purpose other than recording the required information.

B. Changes: Clearly and correctly mark the Field Record Set to show all changes made during construction at the time the changed Work is installed. No changes shall be made in the Work unless authorized by a Modification or by the specific approval of deviations or revisions in submittals.

C. Final Record Drawings: Prior to Substantial Completion, the Architect will furnish to the Contractor a set of computer disks in AUTO-CAD format of the Contract Drawings, including Clarification and Interpretation Drawings and the Drawings issued by Addenda, if any.

D. Preparation of Final Record Drawings: Contractor shall copy the computer disks furnished by the Architect, convert the copied disks to AUTO-CAD 14 format if necessary and, on the copied disks, transfer all recorded changes in the Work shown and noted on the Field Record Set in AUTO-CAD 14 format. Changes for all trades shall be neatly and clearly indicated, detailed, and noted, technically correct, and clearly identified by high-lighting, clouding, or by other suitable method.

E. Approval: Prior to the Architect's inspection for Substantial Completion, submit both the Field Record Set and a reproducible print-out of Contractor's AUTO-CAD 14 Final Record Drawings disks to the Architect for review, and make revisions as may be necessary for the Final Record Drawings shown in the Contractor's AUTO-CAD 14 disks to be a true, complete, and accurate record of the Work in the Architect's opinion. If any changes are made in the Work after Substantial Completion, the Contractor's AUTO-CAD 14 Final Record Drawings and the pertinent disks shall be modified accordingly by the Contractor, and all such changes shall be submitted to the Architect. When Final Record Drawings are approved by the Architect, Contractor shall deliver to the Architect one complete set of the revised AUTO-CAD 14 disks printed on mylar, the revised AUTO-CAD 14 disks, and the disks furnished to the Contractor by the Architect.

F. Conferences: The Contractor and any of the Subcontractors involved shall attend post-construction conferences to clarify the Final Record Drawings as may be required by the Owner or Architect, at no extra cost to the Owner.

3.02 RECORD PROJECT MANUAL: Maintain one set of the Project Manual at the site during the Work as a Field Record Manual; furnish copies of the applicable Sections to the various Subcontractors for recording of their parts of the Work. Also maintain one copy of all Addenda, Modifications, and approved submittals at the site with the Field Record Manual. Keep Field Record Manual and data in good order and readily available to Architect, Owner, and their representatives. Keep the Field Record Manual separate from all other documents and do not use the Field Record Manual for any purpose other than recording the required information.

A. Changes: Before the start of Work, annotate the Field Record Manual to include all changes which result from Addenda and all changes to the Project Manual resulting from revisions to the Contract requirements which affect the Project Manual as agreed between the Owner and Contractor and included in the Agreement. During the Work, clearly and correctly annotate the Field Record Manual to record the contents of approved submittals and all changes made to the Work at the time the changed Work is installed. No such changes shall be made in the Work unless authorized by a Modification or by the specific approval of deviations or revisions in submittals.

B. Annotation Methods: Annotate each affected page with clearly written or typewritten notes describing the Section, page number, and the paragraph number affected, source of each change (i.e., Addendum number, approved submittal identification, etc.) and the changes to each, stapled or suitably attached to the affected page. At the front of the Field Record Manual, maintain a log listing each Section and page number on which changes occur.

C. Approval: Before the Architect's inspection for Substantial Completion, submit the Field Record Manual at the same time as the Final Record Drawings to the Architect for review, and make revisions as may be necessary for Field Record Manual to be a true, complete, and accurate record of the Work in the Architect's opinion. If any changes are made in the Work after Substantial Completion, the Field Record Manual shall be modified accordingly by the Contractor, and all such changes shall be submitted to the Architect.

3.03 MANUALS: Obtain data from the applicable manufacturers and submit the instruction, operation, and maintenance manuals to the extent required under other Sections of the Specifications. Each manual shall have an index listing the contents.

A. Contents: Information in manuals shall include not less than (1) general, introduction, and equipment descriptions, purposes, functions, and simplified theory of operation, (2) specification and data, (3) installation and connection instructions, procedures, sequences, and precautions, including the tolerances for horizontal, vertical, and level alignments, (4) grouting requirements including grout spaces and materials, (5) list showing lubricants for operable equipment, approximate quantities required per year, and the recommended lubrication intervals; where possible, consolidate lubricant types with the pertinent equipment manufacturers' approval to minimize the number of different lubricants required for equipment maintenance, (6) start-up, operational, and shut-down procedures, (7) short term and long term inactivation procedures, (8) maintenance and repair instructions, (9) calibration instructions, (10) parts lists and list of spare parts recommended by manufacturers to be maintained at the site, (11) list of all special tools, instruments, accessories, and special lifting and handling devices required for periodic equipment maintenance, repair, adjustment, and calibration, and (12) all other information as may be specified elsewhere or required for approval.

B. Format and Binding: Include detail drawings and pictorials to illustrate the text as necessary to present complete information. Where the information includes a family of similar items, strike out the inapplicable information or identify applicable portions by heavily weighted arrows, boxes, or circles. Bind the manuals in sturdy covers labeled to show the project title and the equipment to which it applies. Bind manuals less than 1" thick in standard 3-ring binders; other manuals shall have sturdy covers secured with removable rigid metal fasteners and, when more than 2" thick, shall be bound in locking-bar post binders with rigid covers.

C. Manual Submittals: Unless otherwise specified, submit two copies of each manual, one of which will be returned to the Contractor marked to show all required corrections or approval. When approved, deliver four copies to the Architect unless otherwise specified.

3.04 MAINTENANCE MATERIALS: Furnish and deliver spare parts and other maintenance materials required by the Contract Documents, and furnish and deliver the special tools, instruments, accessories, and the special lifting and handling devices shown in manuals approved under Article 3.03 above. Unless otherwise specified or directed, deliver the items to the Owner's storage at the directed location, with the Contractor's written transmittal accompanying each shipment; deliver in the manufacturer's original containers labeled to describe the contents and the equipment or installed part of the Work for which it is furnished. Deliver a copy of each transmittal to the Architect for record purposes.

END OF SECTION

SECTION 01790

WARRANTIES AND GUARANTEES

PART 1 - GENERAL

1.01 SUMMARY: This Section specifies the general requirements for the written warranties and guarantees required by the Contract Documents. Submission to and approval by the Owner of warranties and guarantees is a prerequisite to the final payment under the Contract.

1.02 MANUFACTURERS' WARRANTIES AND GUARANTEES: Deliver all the manufacturers' warranties and guarantees required by the Contract Documents, with the Owner named as beneficiary. In addition, for such equipment and machinery items, or the components thereof, which bear a manufacturers' warranty or guarantee extending for a longer time period than the Contractor's warranty and guarantee, deliver the manufacturers' extended warranties or guarantees in the same manner. Refer to Section 01330, Article "Equipment Data Submittals", for submission of manufacturers' warranty or guarantee data.

1.03 FORM OF WARRANTIES OR GUARANTEES: Warranties and guarantees, excepting manufacturers' standard printed warranties and guarantees, shall be submitted on the Contractor's, Subcontractor's, supplier's, or manufacturer's letterhead, as applicable, countersigned by the Contractor, all addressed to the Owner. Warranties and guarantees shall be submitted in duplicate, and in the form shown on the following page, signed by all pertinent parties and by the Contractor in every case, with modifications as may be approved by the Owner to suit the conditions pertaining to the warranty or guarantee.

1.04 SUBMISSION OF WARRANTIES: The Contractor shall collect and assemble all written warranties and guarantees into two bound books and deliver the bound books to the Architect for delivery to the Owner and the Owner's attorney for final review and approval.

(SECTION CONTINUES)

WARRANTY/GUARANTEE FOR _____WORK

We, the undersigned, do hereby warranty and guarantee that the parts of the Work described above which we have furnished and/or installed for:

FOX ENTERTAINMENT GROUP
NEW OFFICE BUILDING
STUDIO AREA 1

is in accordance with the Contract Documents and that all said Work as installed will fulfill or exceed all of the Warranty and Guarantee requirements. We agree to repair or replace the Work installed by us, together with any adjacent Work which is displaced or damaged by so doing, that proves to be defective in workmanship, material, or operation within a period of _____( ) year(s) from date of final acceptance of the Work by the Owner or from the Date of Certificate of Substantial Completion, whichever is earlier, ordinary wear and tear and unusual neglect or abuse excepted.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time period determined by the Owner, after notification in writing, we, the undersigned, all collectively and separately, hereby authorize the Owner to have said defective Work repaired and/or replaced and made good, and agree to pay to the Owner upon demand all moneys the Owner may expend in making good the said defective Work including collection costs and reasonable attorneys' fees.

Date:_____ _____
(Subcontractor, Sub-subcontractor, Manufacturer, or Supplier)

By _____
Title _____
License No. _____

Date:_____ _____
(Contractor)

By _____
Title _____
License No. _____

Local Representative: For maintenance, repair, or replacement service, contact:

Name: _____
Address:_____
Phone Number: _____

END OF SECTION

SECTION 02220

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Perform demolition and disposal as indicated and specified. Include removing and disposing of or salvaging materials as indicated on the Drawings or directed by the Owner, Architect, or Engineer. The work also includes the backfilling of trenches, holes, or pits that result from such removals.

1.02 QUALITY ASSURANCE: Demolition shall be performed in accordance with Standard Specifications for Public Works Construction, latest edition and supplements, and Building Code. The Contractor shall have one copy of the Standard Specifications at the job site. The Standard Specifications apply only to performance of Work; the legal/contractual relationship sections and measurement and payment sections therein do not apply to this document.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 DEMOLITION: With certain exceptions, the Contractor shall raze, remove, and dispose of all buildings and foundations, structures, paving, fences, and other obstructions that lie wholly or partially within the construction limits. Exceptions are utility-owned equipment and any other items the Owner may direct the Contractor to leave intact.

A. Work Included: The Contractor shall

1. Remove foundations completely;
2. Fill cavities left by the removal of structures. The fill shall match the level of surrounding ground. Any such fill shall be compacted to meet the requirements of Section 02300;
3. Make a vertical saw cut between any existing improvements to remain and portion to be removed;
4. Bituminous pavement shall be removed to clean, straight lines; and
5. Concrete pavement shall be removed to neatly sawed edges. Saw cuts shall be made to 1-1/2 inches, minimum.

B. Unless otherwise indicated on the Drawings, remove all demolished material from the site and dispose of at approved disposal sites. The Contractor shall obtain and pay for necessary permits for the transportation of material from the site.

C. Any material not named as the Owner's property will belong to the Contractor. The Contractor shall store or dispose of such material off-site in a safe and legal manner at no expense to the Owner.

D. Replace at no expense to the Owner any existing improvements to remain that are damaged during the removal of other improvements.

END OF SECTION

SECTION 02235

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. The work includes clearing and grubbing areas within the boundary limits shown on the Drawings or staked by the Surveyor. This work also includes protecting from harm all trees, bushes, shrubs, or other objects selected to remain.

1.02 QUALITY ASSURANCE: All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 OPERATIONS: The Work of this Section includes all labor, materials, equipment, and services necessary to complete all clearing and grubbing together with the removal and disposal of items, as shown on the Drawings and as specified herein, complete.

A. Condition of Premises: Accept the premises as found and clear the Project site as specified.

B. Disposal: Shall be in conformance with Owner's requirements.

C. Removal: All cleared and grubbed plants and construction debris shall be promptly removed away from the Project site, completely. Do not store or permit materials to accumulate on the Project site.

D. Trees: Fall trees, dispose of the trees and other vegetation designated for removal together with the downed timber, snags, brush, and rubbish, occurring within the construction limits. All limbs, branches, and roots damaged during construction, together with those required to be trimmed, shall be neatly cut next to the bole of the tree or main branch or root under the direction of a certified Arborist.

E. Grubbing: Grub deep enough to remove all stumps, large roots, buried logs, and other vegetative material.

F. Stumps: Remove and dispose of all stumps above grade, all matted roots, and all roots larger than 3-inches in diameter to a depth of 12-inches.

G. Trees and tree stumps designated for removal shall be removed completely within project boundaries.

END OF SECTION

SECTION 02250

SHORING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide shoring and bracing for excavations, complete.

1.02 QUALITY ASSURANCE: Refer to Section 01450.

A. Regulatory Requirements: Refer to Construction Safety Orders, Title 8, CCR, Section 1503 and Article 6; secure and pay for required permits.

B. Professional Observation: Perform Work of this Section under observation and approval of the Soils Engineer. Give Soils Engineer not less than 48 hours advance notice of readiness for observation.

C. Design of Shoring: Employ and pay a California registered civil engineer to prepare and stamp drawings and calculations showing shoring methods, bracing or tie back anchoring, wall supporting systems, and other systems to be used for protection of adjacent existing structures and improvements and for earth banks; civil engineer also shall obtain approvals for shoring into adjacent properties or into public property. The civil engineer shall submit these shoring drawings and calculations to the Soils Engineer and Structural Engineer for discussions but not for approval, obtain Building Department approval prior to start of any construction involving shoring and pay fees and charges, and file three copies of the Building Department approved drawings and calculations with the Architect for record purposes only and not for review or approval.

1.03 PROJECT/SITE CONDITIONS:

A. Data: Refer to Geotechnical Investigation Report.

B. Protection: Provide and maintain protection to retain earth banks and to protect adjoining grades and structures from caving, sliding, erosion, or other damage.

C. Photographs and Surveys: Refer to Section 01320. Contractor's Surveyor shall survey, and resurvey at not more than monthly intervals, all existing improvements to record any movements, and shall also periodically survey lateral and vertical locations of the tops of shoring installations and lateral movement along entire length of all runs of shoring. File two sets of photographs and survey records with Architect for record purposes only.

PART 2 - PRODUCTS

2.01 MATERIALS: Clean sand and pea gravel from approved sources.

PART 3 - EXECUTION

3.01 SHORING: Conform to the shoring drawings and calculations approved by the Building Department. Lag, drill, grout, preload and/or test tie-back anchors or bracing, and furnish required testing equipment as recommended and approved by the Soils Engineer. Perform preloading and testing under observation of the Soils Engineer.

3.02 REMOVAL: Remove shoring, sheeting or sheet piling, and detension tie-back anchors as required, unless otherwise indicated or approved. Fill voids left by removals with compacted sand or pea gravel backfill.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Perform earthwork in accordance with the Contract Documents.

1.02 REFERENCES: Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:

A. ANSI A10.2 "Safety Code for Building Construction".
B. AASHTO "American Association of State Highway and Transportation Officials".
C. Part 1926, subpart P, "Excavation, Trenching and Shoring", CONSTRUCTION SAFETY AND HEALTH REGULATIONS (OSHA), including Sections relative to protection of public; sheet piling, shoring and bracing; trenches and excavating equipment.
D. Cal/OSHA.
E. "Standard Specifications for Public Works Construction", latest edition.

1.03 DEFINITIONS:

A. Classified Excavation: Removal and disposal of materials not defined as rock.

B. Unclassified Excavation: Removal and disposal of materials encountered regardless of the nature of materials, including rock.

C. Unauthorized Excavation: Removal of materials beyond the indicated sub-grade elevations or dimensions without Architect's authorization. No payment will be made for unauthorized excavation or remedial work.

D. Authorized Additional Excavation: Removal of material authorized by the Architect based on determination by Testing Agency that the material is soil not capable of supporting design load, or otherwise unsuitable material. Payment will be made for authorized additional excavation and remedial work in accordance with applicable provisions of Contract Documents.

1.04 SUBMITTALS: Refer to Section 01330 for procedures.

A. Testing Laboratory Soil Reports: The following reports are to be submitted directly to Architect by Soils Testing Laboratory, with copy to Contractor and others where indicated:

1. Report and certification of Granular Fill and Drainage Fill.
2. Test reports on borrow material.
3. Report on actual unconfined compressive strength or field density test for sub-grades.
4. Verification of each footing sub-grade.
5. One optimum moisture-maximum density curve for each type of soil encountered.
6. Field density test reports.

1.05 QUALITY ASSURANCE:

A. Regulatory Requirements:: Perform excavation work in compliance with the applicable requirements of laws, codes, ordinances and regulations of Federal, State, County and Municipal authorities having jurisdiction over Work.

1. Shoring and Bracing: Comply with the requirements of County and Municipal Codes having jurisdiction over work. Secure approval by authorities administering this code before proceeding with Work.

2. When such laws, codes or ordinances contain more stringent requirements than the Contract Documents, the more stringent requirements govern.

B. Standard Specifications: All Work of this Section shall be performed and materials shall be used in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements. The Contractor shall have one copy of the Standard Specifications at the job site. The Standard Specifications apply

only to performance and materials and how they are to be incorporated into the Work; the legal/contractual relationship sections and the measurement and payment sections therein do not apply to this Section.

1.06 PROJECT CONDITIONS: Examine the site, Drawings, records of existing utilities and construction, record of test borings, and subsurface exploration report; "Geotechnical Engineering Investigation - Proposed Office Building and Parking Structure, Fox Studio lot" – dated November 10, 2003, addendum I, dated December 1, 2003 and II dated May 5, 2004; will be made available by the Owner. Records of test borings are for information only and are not guaranteed to represent all conditions that will be encountered.

1.07 PROTECTION: The Owner will employ and pay the Soils Engineer as specified in Section 01450. The Soils Engineer will advise on construction techniques involved in the Work, including design, checking and approving of temporary bracing, sheeting, shoring, underpinning and other items pertinent to the Work, and encountered during prosecution of the Work. The Soils Engineer will be concerned with construction methods which will prevent settlement or damage to the surrounding structures, sidewalks, embankments, utilities and roads on Owner's property and adjoining property.

A. Existing Utilities:

1. Maintain existing utilities that are to remain in service. Before excavating over or adjacent to existing utilities, notify utility Owner to ensure protective work will be coordinated and performed in accordance with utility owner's requirements. If existing service lines, utilities and utility structures, which are to remain in service, are uncovered or encountered during these operations, safeguard and protect from damage.

2. Within limits of excavation, remove existing piping, subsoil drainage systems, conduit, manholes and relocated items, which are to be abandoned. Plug open ends of utilities to remain with concrete.

3. Re-route existing subsoil drains which obstruct work around new construction, or incorporate them into new drainage systems.

4. Consult Architect immediately for directions, should uncharted or incorrectly charted piping or other utilities be encountered during excavation. Cooperate with Owner and public and private utility companies in keeping their respective services, utilities and facilities in operation. If damaged, repair utilities to satisfaction of Architect and utility owner concerned.

B. Existing Facilities: Protect and maintain in satisfactory manner, existing pavements, curbs, gutters, structures, conduits, fences, walls and other facilities to remain above and below grade. Restore facilities damaged by construction operations.

C. Pumping and Draining: Excavate areas in such manner as to afford adequate drainage. Control grading in vicinity of excavated areas so ground surface will slope to prevent water running into excavated areas. Until the Work is completed, remove water from areas of construction that may interfere with proper performance of Work or that may result in damage to the soil sub-grade and provide sumps, pumps, well points, electric power and attendance required for this purpose on a 24 hour basis if necessary. Protect construction from water during construction, including prevention of erosion of completed work during construction and until permanent drainage and erosion controls are operational. Repair adjoining properties, facilities and streets damaged due to improper protection.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General Fill: Sand, gravel, friable earth, or non-expansive clays, subject to the Testing Laboratory's approval. Fill and backfill material shall be free of organic material, slag, cinders, expansive soils, trash, or rubble and stones having maximum dimension greater than 6 inches. Herein, expansive soil is as defined in the project's geotechnical report.

1. Material used for fill and backfill under paved areas, within 10 feet of the pavement sub-grade: Non-expansive as determined by Testing Laboratory.

2. Top 18 inches of sub-grade fill under lawn areas: Earth shall contain not more than 10 percent of stones or lumps larger than 1-1/2 inches.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Reference Points: Provide and maintain throughout construction, benchmarks and other reference points on and off site.

B. Site Preparation: Clean areas within Contract Limit Lines as required. Remove trees (except trees indicated to remain or to be relocated), shrubs and vegetation. Prior to removal of trees or other existing items, verify removal with Owner in writing.

1. Strip topsoil in areas of building and paving construction and stockpile on site at a location approved by Owner. Remove subsoil, stones, clods of hard earth, plants and their roots, sticks and other matter not conducive to plant growth.

2. Remove existing concrete, masonry, rubble, and paving to a depth of at least 24 inches below sub-grade in paved and graded areas. In areas to be paved, spread leveling courses of crushed material acceptable to Architect over surface of remaining rubble and compact with vibrating compactors. Provide additional crushed material and compact as required to produce a dense uniform surface. Lift thickness, measured before compaction, shall not exceed 8 inches.

3. Remove rubble beneath areas where building slabs are to be supported on grade. Remove abandoned slabs, footings, foundation walls, pits, manholes, conduit, pipes and other existing below-grade construction that may obstruct new work. Demolish and remove such obstructions as required to provide at least 24 inches horizontal and vertical clearance from new construction, including excavation and placement of engineered fill beneath footing and slabs-on-grade.

4. Beneath areas where building slabs, walks and paving are supported on grade, excavate existing fill soils and loose, soft, or disturbed natural soils and replace with properly compacted fill per Soils Testing Laboratory's recommendations.

C. Fill above described areas to sub-grade with acceptable material as specified.

3.02 EXCAVATION FOR GENERAL GRADING: In addition to requirements for clearing, excavate to the subgrades indicated on grading plan. Over excavation for building pads is shown in Soils Report. Fill and compact excavations made below elevations indicated unless authorized by Architect, as specified for filling and compacting at no additional cost to Owner.

3.03 ROCK EXCAVATION:

A. Rock Estimate: Should rock be encountered, total amount of rock in place to be excavated shall be determined as hereinafter specified. Adjustment for excavation of such rock will be made as provided by Contract Documents.

B. Rock Classification: Rock is classified as solid rock in ledges, bedded deposits or conglomerate deposits so firmly cemented as to present characteristics of solid rock and which cannot be removed with a 3/4 cubic yard capacity power shovel without drilling and blasting, and boulders having volume of more than 1/2 cubic yard. Rocks over 6 inches shall be removed.

C. Rock Survey: Before excavating material which Contractor may claim as rock excavation, uncover and expose material to permit accurate measurements and notify Architect before proceeding. No payment will be allowed for rock or cemented materials, which have not been uncovered and measured as specified, nor for boulders that have not been separated from earthwork for proper measurements. Material uncovered shall then be cross-sectioned and measured and quantities within rock payment lines hereinafter specified shall be computed and certified by a registered professional engineer or registered land surveyor engaged and paid for by Contractor.

D. Records: Submit complete current records of quantities of rock excavated, methods of excavation used, and extent of labor and equipment involved, date and sign record by professional engineer or land surveyor, and send copies to Architect for approval. Such records shall also include plot plans at suitable scale, showing elevations and other measurements of rock excavation and location and measurements of computed volumes of boulders encountered. Provide labor and equipment necessary to make these records. No payment will be considered for rock, which has been removed without obtaining required data.

3.04 FILLING:

A. Materials for fills shall consist of acceptable material, as specified in Article "MATERIALS", obtained from required excavation on site, or from borrow sources. Materials shall be reviewed by Soils Engineer and Testing Laboratory and may be reviewed by Architect.

B. Utilization of Excavated Materials: Suitable excavated material, as specified in Article MATERIALS", may be used in formation of fills and for backfilling. Separate unsuitable material from material that is suitable for fill. Separate material suitable for fill under slabs and paving and for backfill from material that is only suitable for general grading.

C. Borrow: Acceptable borrow shall consist of suitable material specified in the Article "MATERIALS". Submit representative samples of each type of borrow material to Testing Laboratory for approval prior.

D. Fill under Paved Areas, Building Slabs and Structural Members: Place fill materials in horizontal loose layers; spread, mix and place in such manner as to produce uniform thickness of material. Start placement in deepest area and progress approximately parallel to finished grade. Layers shall not exceed 8 inches in thickness prior to compaction. Do not place fill material on areas where free water is standing, or on surfaces that have not been approved by Soils Testing Laboratory.

E. Compaction: Compact each layer of fill with acceptable equipment to achieve the following minimum percentages of maximum dry density at the moisture content specified. Compact all fill to at least 90%. Compaction or consolidations by soaking or jetting with water are not acceptable alternative methods to utilization of mechanical equipment.

F. Moisture Control for Fill and Sub-grade

1. Maintain moisture content by wetting or drying manipulation. Suspend compacting operations when satisfactory results cannot be obtained because of rain or other unsatisfactory conditions.

2. Sprinkle with water fill and sub-grade material which does not contain sufficient moisture to be compacted in accordance with requirements of Specifications.

3. Dry fill and sub-grade material containing excess moisture prior to or during compaction to moisture content not greater than two percentage points (2%) above optimum. Reduce moisture content of material which displays pronounced elasticity or deformation under action of loaded rubber tired conveyances to optimum if necessary to secure stability. For sub-grade material, these requirements for maximum moisture apply at time of compaction of sub-grade.

4. In lieu of drying by manipulation, hydrated lime, monohydrated lime or similar beneficial ingredients may be used to reduce moisture content, reduce plasticity index or improve workability. Apply such ingredients in manner and quantity recommended by manufacturer or as required by Soils Testing Laboratory.

G. Fill Under Areas of General Grading: Obtain material for fill from excavation or from borrow sources as specified. Place fill in 8-inch layers (maximum) to suitable elevation above sub-grade to provide for anticipated settlement to elevation indicated. Compact layers to specified density at optimum moisture content as determined by ASTM D1557.

3.05 FIELD QUALITY CONTROL:

A. General: As specified in Section 01450, the Owner will employ, at its expense a Testing Laboratory to perform tests and submit reports specified in this Section. The Testing Laboratory will conduct and interpret tests; state in reports whether test results indicate conformance with the Contract Document requirements, and note deviations.

B. Tests: Soils Testing Laboratory will perform tests herein specified and additional tests required, and submit test reports to Architect including the following:

1. Optimum Moisture-Maximum Density Curve shall be supplied by the Soils Testing Laboratory. Determine maximum densities by ASTM D1557.
2. Should borrow material be required, each soil type shall receive mechanical analysis, plasticity index determination, moisture-density curve determination and expansion index analysis by the Testing Laboratory as required.

C. Sub-grade and Fill Layers: Soils Testing Laboratory shall approve Sub-grades and fill layers before construction of further work thereon. Tests of sub-grades and fill layers will be taken as follows:

1. Make at least one field density test of sub-grade for every 500 cubic yard minimum or when specified by the Soils Testing Laboratory.

2. Backfill: Take field density tests along walls at 150 foot maximum centers at elevations to be determined but no greater than two feet vertical intervals.

D. Cooperate with Soils Testing Laboratory in performance of required tests.

E. If, in Architect's opinion, based on Testing Laboratory's reports, fill that has been placed is found to be below specified density, Architect will require additional compaction and testing at Contractor's expense.

3.06 DISPOSAL OF EXCAVATED MATERIALS:

A. Dispose of the following material off the Owner's property:

1. Unsuitable excavated materials.
2. Excess excavated material.
3. Stripped topsoil which is not being stockpiled for future work, unless disposition on the site is directed by the Owner.

B. Do not burn material resulting from clearing and grubbing operations on site. Remove from Owner's property.

END OF SECTION

SECTION 02312

EARTHWORK FOR GRADING AND PAVING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Perform all work necessary to complete all site clearing, excavating, filling, and grading, including preparation of sub-grade for sidewalks, curb/gutter and pavement as indicated on Drawings or inferable there from and/or as specified, complete, in accordance with requirements of Contract Documents.

A. Definitions: Sub-grades are below the base course for paving or curb/gutter sections and similarly below the granular base for sidewalks.

B. Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and payment sections therein do not apply to Work of this Section.

1.02 REFERENCES: Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:

A. AASHTO - "American Association of State Highway and Transportation Officials".
B. Part 1926, Subpart P, "Excavation, Trenching and Shoring", CONSTRUCTION SAFETY AND HEALTH REGULATIONS (OSHA), including Sections relative to protection of public; sheet piling, shoring and bracing; trenches and excavating equipment.
C. Cal/OSHA.
D. "Standard Specifications for Public Works Construction", latest edition.

1.03 DEFINITIONS:

A. Classified Excavation: Removal and disposal of materials not defined as rock.

B. Unclassified Excavation: Removal and disposal of materials encountered regardless of the nature of materials, including rock.

C. Unauthorized Excavation: Removal of materials beyond indicated sub-grade elevations or dimensions without Architect's authorization. No payment will be made for unauthorized excavation or remedial work.

D. Authorized Additional Excavation: Removal of material authorized by Architect based on determination by Testing Agency that the material is soil not capable of supporting design load, or otherwise unsuitable material. Payment will be made for authorized additional excavation and remedial work in accordance with applicable provisions of Contract Documents.

1.04 SUBMITTALS: Refer to Section 01330 for procedures.

A. Testing Laboratory Soil Reports: The following reports shall be submitted in triplicate directly to the Architect by Testing Laboratory, with copy to Contractor and others where indicated:

1. Test reports on suitability of on-site materials for use as engineered fill.
2. Test reports on suitability of borrow material for use as engineered fill.
3. One optimum moisture-maximum density curve for each type of soil encountered.

1.05 QUALITY ASSURANCE:

A. Regulatory Requirements:

1. Excavation Work: Perform in compliance with applicable requirements of laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction over work.

2. Shoring and Bracing: Comply with requirements of Municipal Code having jurisdiction over work. Secure approval by authorities administering this code before proceeding with work.

3. When such laws, codes or ordinances contain more stringent requirements than the Contract Documents, the more stringent requirements govern.

4. Field density test reports for existing sub-grade and compacted fills.

5. Standards: The Contractor shall provide for protection of the public, employees, and property in accordance with the applicable requirements of Part 1926, subpart P, "Excavation, Trenching and Shoring," CONSTRUCTION SAFETY AND HEALTH REGULATIONS (OSHA), which, by reference, is made a part of this Specification, including Sections relative to protection of the public; sheet piling, shoring and bracing; trenches and excavating equipment; in addition comply with applicable requirements of Cal/OSHA.

1.06 PROJECT CONDITIONS: Examine site, Drawings, records of existing utilities and construction, record of test borings, subsurface exploration report; Geotechnical Engineering Investigation – "Proposed Office Building and Parking Structure, Fox Studio Lot" –dated November 10, 2003, addendum I, dated December 1, 2003 and II dated May 5, 2004; prepared by Geotechnologies Inc., which will be made available by Owner. Records of test borings are for information only and are not guaranteed to represent all conditions that will be encountered. Excavation shall not be classified.

1.07 PROTECTION:

A. Soils Engineer: Refer to Section 01450. The Owner will employ and pay, at its expense, services of qualified Soils Engineer to advise the Owner on construction techniques involved in this work, including design, checking and approving of all temporary bracing, sheeting, shoring, underpinning and other items pertinent to work, and encountered during prosecution of work. The Soils Engineer shall be primarily concerned with construction methods which will prevent settlement and/or damage to surrounding structures, sidewalks, embankments, utilities, roads, etc. on Owner's property and on property adjoining site of the Work.

B. Existing Utilities.

1. Maintain existing utilities that are to remain in service, until after utilities have been relocated. Before excavating over or adjacent to existing utilities, notify utility Owner to ensure protective work will be coordinated and performed in accordance with utility Owner's requirements. If existing service lines, utilities and utility structures that are to remain in service are uncovered or encountered during these operations, safeguard and protect from damage and supported if necessary.

2. Within limits of excavation, remove existing piping, subsoil drainage systems, conduit, manholes and relocated items, which are to be abandoned. Plug open ends with concrete.

3. Re-route existing subsoil drains that obstruct work around new construction, or incorporate them into new drainage systems.

4. Consult Architect immediately for directions, should uncharted or incorrectly charted piping or other utilities be encountered during excavation. Cooperate with Owner and public and private utility companies in keeping their respective services, utilities and facilities in operation. If damaged, repair utilities to satisfaction of Architect and utility owner concerned.

C. Existing Facilities: Protect and maintain in satisfactory manner, existing pavements, curbs, gutters, structures, conduits, fences, walls and other facilities above and below grade. Restore facilities damaged by construction operations.

D. Pumping and Draining: Excavate areas in such manner as to afford adequate drainage. Control grading in vicinity of excavated areas so ground surface will slope to prevent water running into excavated areas. Until work is completed, remove water from areas of construction that may interfere with proper performance of work or that may result in damage to the soil sub-grade and provide sumps, pumps, well points, electric power and attendance required for this purpose on a 24 hour basis if necessary. Protect construction from water during construction, including prevention of erosion of completed work during construction and until permanent drainage and erosion controls are operational. Repair adjoining properties, facilities and streets damaged due to improper protection.

PART 2 - PRODUCTS

2.01 MATERIALS: General Fill shall be sand, gravel, friable earth, or non-expansive clays, subject to Soils Engineer and Testing Laboratory approval. Fill and backfill material shall be free of organic material, slag, cinders, expansive soils, trash, or rubble and stones having maximum dimension greater than 6 inches. In these Specifications, expansive soil is as defined in the project's geotechnical report.

PART 3 - EXECUTION

3.01 PREPARATION: Reference Points: Provide and maintain throughout construction, benchmarks and other reference points on and off site.

A. Site Preparation: Clean areas within Contract Limit Lines as required. Remove trees (except trees indicated to remain or to be relocated), shrubs and vegetation. Prior to removal of trees or other existing items, verify removal with Owner in writing.

1. Strip topsoil in areas of building and paving construction and stockpile on site where indicated. Remove subsoil, stones, clods of hard earth, plants or their roots, sticks and other matter not conducive to plant growth.

2. Remove existing concrete, masonry, rubble, and paving to a depth of at least 24 inches below sub-grade in paved and graded areas. In areas to be paved, spread leveling courses of crushed material acceptable to Architect over surface of remaining rubble and compact with vibrating compactors. Provide additional crushed material and compact as required to produce a dense uniform surface. Lift thickness, measured before compaction, shall not exceed 8 inches.

3. Remove rubble beneath areas where building slabs are to be supported on grade. Remove abandoned slabs, footings, foundation walls, pits, manholes, conduit, pipes and other existing below-grade construction that may obstruct new work. Demolish and remove such obstructions as required to provide at least 24 inches horizontal and vertical clearance from new construction, including excavation and placement of engineered fill beneath footing and slabs-on-grade.

4. Beneath areas where building slabs, walks and paving are supported on grade, excavate existing fill soils and loose, soft, or disturbed natural soils and replace with properly compacted fill per Soils Testing Laboratory's recommendations.

B. Fill above described areas to sub-grade with acceptable material as specified.

C. Remove material, including topsoil from clearing operations, and dispose of as specified in Paragraph, FILLING.

3.02 EXCAVATION:

A. General: Excavate for all work, to the lines and elevations as required. Do not excavate below the elevations indicated on Drawings without written authorization of the Architect.

B. Excavation for Paved Areas.

1. In addition to requirements for clearing, excavate to sub-grades indicated on Drawings. Where sub-grades contain unsuitable material, as determined by the Soils Engineer and/or Testing Laboratory, such as organic matter, trash, debris, etc., additional excavation will be authorized to remove such unsuitable material. All additional excavation shall be replaced with suitable fill material as herein specified. All sub-grades shall be reviewed by the Soils Engineer and Testing Laboratory before proceeding with the construction of base and pavements.

a. Top 12 inches of sub-grade beneath base for pavements shall be free of unsuitable material and be compacted to at least 90 percent of maximum dry density at about one to two percent wet of the optimum moisture as determined by ASTM D1557.

b. If sub-grade does not meet above requirements, sub-grade shall be compacted by proof-rolling or other suitable compaction equipment to obtain density specified.

2. Unauthorized excavation made below the elevations indicated on the Drawings or required by the Specifications shall be filled and compacted as hereinafter specified for filling and compacting, with no additional payment therefore.

3. Authorized Additional Excavation: Where the Soils Engineer and/or Testing Laboratory determines that the soil encountered at the elevations indicated on Drawings is not capable of supporting design load, or where unsuitable material as defined above is encountered, the Architect may give Contractor written directions to remove unsuitable soil or materials, fill with acceptable suitable material and compact as hereinafter specified for filling and compacting.

C. Excavation for General Grading: In addition to requirements for clearing, excavate to the sub-grades indicated. Excavations made below elevations indicated on Drawings or required by the Specifications, unless authorized in writing by the Architect, shall be filled and compacted as hereinafter specified for filling and compacting, with no additional payment therefore.

3.03 FILLING: Materials for fills shall consist of acceptable material, as specified in Paragraph, MATERIALS, obtained from required excavation on site, or from borrow sources. Materials shall be reviewed by Soils Engineer and Testing Laboratory and may be reviewed by Architect.

A. Utilization of Excavated Materials: Suitable excavated material, as specified in the Paragraph MATERIALS, may be used in formation of fills and for backfilling. Separate unsuitable material from material, which is suitable for fill. Separate material suitable for fill under slabs and paving and for backfill from material, which is only suitable for general grading.

B. Disposal of Excavated Materials: Contractor shall dispose of following material off site legally at his own expense.

1. Material resulting from clearing operations and excavated material that is unsuitable for fill.
2. Excess excavated materials.
3. Stripped topsoil that is not being stockpiled for future work.

C. Borrow: Acceptable borrow shall consist of suitable material specified in the paragraph MATERIALS. Submit representative samples of each type of borrow material to Soils Testing Laboratory for approval prior to importing to site.

D. Fill under Paved Areas and General Grading: Place fill materials in horizontal loose layers; spread, mix and place in such manner as to produce uniform thickness of material. Start placement in deepest area and progress approximately parallel to finished grade. Layers shall not exceed 8 inches in thickness prior to compaction. Do not place fill material on areas where free water is standing, or on surfaces that have not been approved by Testing Laboratory.

E. Compaction: Compact each layer of fill with acceptable equipment to achieve the following minimum percentages of maximum dry density at optimum moisture:

1. Fills in paved areas shall be compacted to a minimum of 90% dry density at about one to two percent wet of the optimum moisture as determined by ASTM D1557.

2. In case of cohesive soil, compact materials at moisture content about 2 to 4 percent above optimum moisture content. A uniform moisture content will be required throughout layers of fill materials. Wetting or drying manipulation shall be required if necessary to accomplish this. Suspend compaction operations when satisfactory results cannot be obtained because of rain or other unsatisfactory conditions.

3. Compaction or consolidations by soaking or jetting with water are not acceptable alternative methods to utilization of mechanical equipment.

F. Moisture Control for Fill and Sub-grade

1. Maintain moisture content by wetting or drying manipulation. Suspend compacting operations when satisfactory results cannot be obtained because of rain or other unsatisfactory conditions.

2. Sprinkle with water fill and sub-grade material which does not contain sufficient moisture to be compacted in accordance with requirements of Specifications.

3. Dry fill and sub-grade material containing excess moisture prior to or during compaction to moisture content not greater than two percentage points (2%) above optimum. Reduce moisture content of material that displays pronounced elasticity or deformation under action of loaded rubber tired conveyances to optimum if necessary to secure stability. For sub-grade material, these requirements for maximum moisture apply at time of compaction of sub-grade.

4. In lieu of drying by manipulation-hydrated lime, monohydrated lime or similar beneficial ingredients may be used to reduce moisture content, reduce plasticity index or improve workability. Apply such ingredients in manner and quantity recommended by manufacturer or as required by Testing Laboratory.

3.04 FIELD QUALITY CONTROL: Refer to Section 01450.

A. General: Owner will employ, at its expense, a Testing Laboratory, to perform tests and submit reports specified in this Section. The Testing Laboratory shall be responsible for conducting and interpreting tests; shall state in each report whether or not test results indicate conformance with all requirements of the Contract Documents, and shall specifically note any deviations there from.

B. Tests: Testing Laboratory will perform tests herein specified and any additional tests required, and submit test reports to the Architect:

1. One Optimum Moisture-Maximum Density curve shall be made for each type of soil encountered in sub-grades.
2. One Optimum Moisture-Maximum Density curve shall be made for each type of soil proposed for filling.
3. Maximum densities shall be determined by ASTM D1557.
4. Testing Laboratory shall determine the suitability of all sub-grades and subsequent compacted fills and all filling materials.
5. Borrow material for fills, etc., shall be evaluated by some or all of following tests, a mechanical analysis, plasticity index determination, and expansion index analysis.
6. The density at the top 12" of sub-grade resulting from excavation shall be determined by testing.
7. In fill areas, density of each layer of fill shall be determined by testing and shall meet the required density as specified as a minimum with no test below the specified value.

C. Sub-grade and Fill Layers: Testing Laboratory shall approve subgrades and fill layers before construction of further work thereon. Tests of sub-grades and fill layers will be taken as follows: Make at least one field density test of sub grade for every 500 cubic yard minimum or when specified by the Testing Laboratory.

D. Contractor shall cooperate with the Testing Laboratory in every respect in performance of required tests.

END OF SECTION

SECTION 02313

EARTHWORK FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Perform earthwork for utilities as necessary to complete all site clearing, excavating, filling and grading, complete, as shown on the Drawings or inferable there from and/or as specified in accordance with requirements of the Contract Documents.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit Shop Drawings for Work of this Section.

B. Test Reports: Prior to use and with sufficient time for review, submit certified test reports showing compliance of following items. Provide samples of materials if required for verification by Testing Laboratory.

1. Gradation for bedding materials.
2. Gradation for imported fill, granular fills, etc.
3. Trench chemical stabilization materials.

C. Testing Laboratory Reports: In addition to distribution of test results as specified in Section 01450, the following reports shall be submitted in duplicate directly to the Architect by the Testing Laboratory, with copy to the Contractor and others where indicated or specified:

1. Report and certification of all fill materials.
2. Test reports on borrow material prior to use.
3. Report on field density test for subgrades.
4. Verification of subgrade below all utility piping, vaults and other appurtenances for acceptable materials and density.
5. Verification of vertical subgrades at thrust blocks for allowable passive pressure as recommended in soil report.
6. One optimum moisture-maximum density curve for each type of soil encountered.
7. Field density test reports for all fills.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements: Excavation work shall be performed in compliance with the applicable requirements of all laws, codes, ordinances and regulations of Federal, State, and Municipal authorities having jurisdiction over this work.

B. Protection: Be solely responsible to provide for the protection of the public, employees and property in accordance with the applicable requirements of the following partial list of regulations such as Part 1926, subpart P, "Excavation, Trenching and Shoring", CONSTRUCTION SAFETY AND HEALTH REGULATIONS (OSHA), which, by reference, is made a part of this Specification, including Sections relative to protection of the public; sheet piling, shoring and bracing; trenches and excavating equipment; in addition comply with applicable requirements of Cal/OSHA, California Construction and General Safety Orders, Occupational Safety and Health Act (1970 and updates), Construction Safety Act and all other applicable governmental requirements, as well as exercising industry standards and any special efforts necessary to provide best standard of safety and protection during Contract period; provide suitable traffic control, signage, lighting, barricades and similar items.

C. Shoring and Bracing: Comply with requirements of Municipal Code having jurisdiction over the work and Title 8, CRC, and must be approved by the authorities administering this Code before proceeding with the Work. Obtain and pay for required permits.

D. When such laws, codes or ordinances contain more stringent requirements than the Contract Documents, the more stringent requirements shall govern this work.

1.04 ENVIRONMENTAL CONDITIONS:

A. Examine the site, Drawings, survey of existing utilities and construction, record of test borings, the subsurface exploration report, "Geotechnical Engineering Investigation Engineering – Proposed Office building and Parking Structure, FOX Studio Lot", dated November 10, 2003; addendum I, dated December 1, 2003 and II dated May. 5, 2004, prepared by Geotechnilogics Inc.; which will be made available by the Owner. The records of test borings are for information only and are not guaranteed to represent all conditions that will be encountered. Excavation shall not be classified.

B. The survey of the site, existing utilities and existing construction (including underground construction) prepared by PSOMAS, dated August 2001 (for engineering documents for work in process planned in certain areas of the Site as well as abutting work) which represent all conditions known to the Owner. Other construction, of which no records are available, may be encountered. The Contractor shall formulate his own conclusions as to the extent of such construction and shall remove all material of any nature to the design subgrades indicated or hereinafter specified.

1.05 PROTECTION:

A. Soils Consultant: Contractor shall have qualified engineering capability on staff or shall retain, at his own expense, the services of a qualified Consultant to advise him on all the construction techniques involved in this work, including design, checking and approving of all temporary bracing, sheeting, shoring, underpinning and other items pertinent to the work, and encountered during the prosecution of the work. Consultant shall be primarily concerned with construction methods which will prevent settlement and/or damage to surrounding structures, sidewalks, embankments, utilities, roads, etc., on the Owner's property and on property adjoining the site of the work.

B. Existing Facilities: Properly protect, maintain and repair in a satisfactory manner, existing pavements, curbs, gutters, structures, conduits, fences, walls and other facilities above and below grade. Restore damaged facilities caused by construction operations.

C. Pumping and Draining: Excavate areas in such manner as will afford adequate drainage. Control the grading in the vicinity of such excavated areas so that the surface of the ground will be properly sloped to prevent water from running into the excavated areas. Until all work is completed, remove all water from any source, in the areas of construction that may interfere with the proper performance of the work, and provide all sumps, pumps, well points, electric power and attendance required for this purpose on a 24 hour basis if necessary. Protect all construction from water from any source during construction, including prevention of erosion of temporary and of completed work during construction and until permanent drainage and erosion controls are operational. Repair adjoining properties, facilities, streets, utilities, appurtenances, etc., which are damaged.

D. Existing Utilities:

1. Maintain existing utilities, which are to remain in service, and existing utilities, which are to remain in service until after relocation and the relocated utilities. Before excavation over or adjacent to any existing utilities, notify the Owner of such utilities to ensure that protective work will be coordinated and performed by Contractor in accordance with requirements of the Owner of the utility. If existing service lines, utilities and utility structures, which are to remain in service, are uncovered or encountered during these operations, they shall be safeguarded, protected from damage and supported.

2. Consult Architect immediately for directions as to procedure, if uncharted or incorrectly charted piping or other utilities are encountered during excavation. Cooperate with the Owner, the public and private

utility companies in keeping their respective services, utilities and facilities in operation. If damaged, utilities shall be repaired to entire satisfaction of the Architect and utility owner concerned.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General Fill: Sand, gravel, friable earth, or non-expansive clays, subject to approval of the Testing Laboratory. Fill and backfill material shall be free of organic material, cinders, slag, expansive soils, trash, or rubble and stones having a maximum dimension greater than 6 inches. In these Specifications, expansive soil is as defined in the project's geotechnical report.

B. Bedding shall be clean coarse sand conforming to the requirements of sand for Portland cement concrete, as specified in Section 200-1.5.5 of the SSPWC.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Reference Points: Provide and maintain throughout construction benchmarks and other reference points on and off site.

B. Preparation of the Site: Clean all areas within limits of construction as required. Immediately prior to removal of trees or any other existing items, all items to be removed shall be verified with the Owner in writing prior to removal.

1. Strip all topsoil encountered. Topsoil, which is to be stockpiled for future use as indicated, shall be carefully stripped, and be free of any admixture of subsoil, stones, clods of hard earth, plants or their roots, sticks and other extraneous matter not conducive to plant growth.

2. Remove all existing concrete, masonry, rubble, and paving to a depth of 24 inches below design subgrade.

3. Beneath areas where slabs are to be supported on grade, removal of rubble is required. Remove any abandoned slabs, footings, foundation walls, pits, manholes, conduit, pipes and other existing below-grade construction that may obstruct the new work. All such obstructions shall be demolished and removed as required to provide at least 24 inches horizontal and vertical clearance from new construction.

C. All above described areas shall be filled to design subgrade with acceptable material as hereinafter specified.

D. All material, including topsoil removed from clearing operations, shall be disposed of as specified in Paragraph, FILLING.

3.02 EXCAVATION:

A. General: Excavate for all work, to the lines and elevation as required. Side forms will be required for all concrete work unless omission of forms is requested by the Contractor and accepted by the Architect; the Contractor shall bear the cost of any additional concrete volume required beyond the minimum profiles and dimensions as sufficiently large to permit placing and removal of forms, installation of waterproofing, damp proofing, backfilling, etc., and for inspection thereof.

1. Do not excavate below the elevations shown on the Drawings without written authorization.

B. Excavation:

1. All subgrades shall be reviewed by the Testing Laboratory before proceeding with the construction that shall be founded on firm, sound, undisturbed natural soil or engineered fill at elevations as indicated on Drawings and as determined by the Testing Agency.

2. If test results and observation by Testing Laboratory indicate that the soil strata is not acceptable as required herein, the depth shall be increased as directed and the above steps repeated, or other acceptable measures taken.

3. Subgrade shall be level and clean of all loose soil, dirt and debris and free of standing water prior to acceptance for placing concrete.

4. If the subgrade does not meet the above requirements, the subgrade shall be compacted by suitable compaction equipment to obtain density specified.

5. Unauthorized Excavation: When suitable bearing strata is encountered at the elevations indicated on Drawings and the construction excavation is made to greater depth, compacted fill or lean concrete fill shall be installed by the Contractor, as directed without additional payment therefore.

6. Authorized Additional Excavation: In case unsuitable bearing as determined by Testing Agency is encountered at the subgrade elevations indicated on the Drawings, the removal of the unsuitable material and placement of compacted fill or lean concrete fill may be directed by written Modification order to Contractor.

3.03 FILLING:

A. Materials for fills shall consist of acceptable material, as specified in Paragraph, MATERIALS, obtained from the required excavation on site, or from borrow sources. The Testing Laboratory shall review all material.

B. Utilization of Excavated Materials: Use all suitable materials removed from excavations in the formation of fills and for backfilling. The Testing Laboratory, as defined in Paragraph, MATERIALS, shall determine suitable excavated material for fills. Unsuitable material, as determined by the Testing Laboratory, shall be separated from material that is suitable for fill and backfill.

C. Disposal of Excavated Materials: The Contractor, at its own expense, shall dispose of the following material off the site legally.

1. Material resulting from clearing operations and excavated material that is unsuitable for fill.
2. Excess excavated materials.
3. Stripped topsoil that is not being stockpiled for future work.

D. Borrow: Where specific materials are required or if additional suitable material is required for fill in excess of that obtained by excavation at the site, obtain same from acceptable sources. All arrangements for obtaining borrow from the offsite shall be the responsibility of the contractor and all costs thereof shall be borne by the Contractor. Acceptable borrow will consist of suitable material for fills as specified in Paragraph, MATERIALS. Representative samples of each type of borrow materials considered suitable shall be delivered to the Testing Laboratory. Any borrow material not meeting the standard herein specified or considered unsuitable by Testing Laboratory shall not be utilized.

E. Fill: Place fill materials in horizontal loose layers and spread, mix and place in such manner as to produce a uniform thickness of material. Placement shall start in the deepest area and progress approximately parallel to the finished grade. Loose thickness of layers before compaction shall not exceed 8 inches. No fill material shall be placed on areas where free water is standing, or on surfaces that have not been tested and approved by the Testing Laboratory.

F. Compaction: Compact each layer of fill with acceptable equipment to achieve specified minimum percentage of maximum density at optimum moisture.

1. For utility lines below and within 20 feet of paved areas, place backfill in horizontal layers not exceeding 8 inches loose thickness and compact to not less than 90% of maximum density and not less than 95% of maximum density in the upper three feet.

2. For utility lines in areas of general grading, place backfill in horizontal layers not exceeding 8 inches loose thickness and compact to not less than 90% of maximum density and not less than 95% of maximum density in the upper three feet.

3. Where fill is required prior to trenching in order to provide adequate cover, the fill materials shall be acceptable to the Testing Laboratory. Each layer shall be compacted to not less than 90% of maximum density in areas of general grading. Compact to not less than 95% of maximum density within 20 feet of paved areas, and within 3 feet of finished grade.

4. In case of cohesive soil, do not proceed with compaction when the moisture varies more than 2% from the optimum moisture content. A uniform moisture content will be required through all the layers of fill materials. Wetting or drying manipulation is required if necessary to accomplish this. Suspend compaction operations when satisfactory results cannot be obtained because of rain or other unsatisfactory conditions.

5. Compaction or densification by soaking, flooding, or jetting with water are not acceptable alternative methods to utilization of mechanical compaction equipment.

6. Subgrade and fill material containing excess moisture shall be required to dry prior to or during compaction to a moisture content not greater than two percentage points (2%) above optimum. For subgrade material, these requirements for maximum moisture shall apply at the time of compaction of the subgrade.

G. Granular Fill: Provide clean granular fill beneath concrete slabs and around piping as required. Fill shall be placed as indicated on the Drawings and as specified. Compact fill with vibratory or tamping methods.

H. Backfilling against Walls: After completion of walls, of vaults and appurtenances, clean the excavation of all trash and debris before application of any dampproofing or waterproofing and placement of backfill. Backfill shall consist of acceptable material as specified in Paragraph, MATERIALS.

1. Maintain symmetrical backfilling loading and compact each layer using hand tampers and other suitable equipment.

2. Do not backfill against walls until completion of slabs and structural members, which provide lateral support to these walls. In placing backfill, take special care to prevent any wedge action, eccentric loading or overloading of all structures by equipment used in compacting and backfill material and to prevent damaging any waterproofing or damp proofing on the walls.

3.04 QUALITY MONITORING:

A. General: Refer to Section 01450.

1. The Owner will employ, at its own expense, a Testing Laboratory to perform all tests and submit reports specified in this Section.

2. The Testing Laboratory shall be responsible for conducting and interpreting the tests; shall state in each report whether or not the test results indicate conformance with all requirements of the Contract Documents, and shall specifically note any deviations therefrom.

B. Tests: Soils Testing Laboratory shall perform all tests herein specified and any additional tests as may be required, and submit test reports to the Architect and as specified in Section 01450.

1. One Optimum Moisture-Maximum density curve shall be made for each type of soil encountered in subgrades.
2. One Optimum Moisture-Maximum density curve shall be made for each type of soil proposed for backfilling trenches or walls, bedding, etc.
3. Maximum densities shall be determined by ASTM DI557.
4. The Testing Laboratory shall determine the suitability of all subgrades and subsequent compacted fills and all filling materials.
5. Borrow material for fills, etc., shall be evaluated by some or all of following tests, a mechanical analysis, plasticity index determination, and expansion index analysis.

C. Subgrade and Fill Layers: The Testing Laboratory, before construction of any further action, shall approve all subgrades and fill layers thereon. Tests of the subgrades and fill layers shall be taken as follows:

1. Subgrades: Perform field density tests of subgrade to verify the minimum densities. Repeat testing after supplementary compaction, if any. For each manhole, make at least one field density test of the subgrade prior to placing granular fill below vault slab.

2. Fills: In fill areas, each layer of fill shall meet required density as specified above as a minimum with no test below the specified minimum percentage. Repeat testing after supplementary compaction, removal and recompaction, etc., if any. Make at least one field density test of granular fill subgrade for each manhole slab.

3. Backfill: Field density tests shall be taken along utility lines at 150 foot maximum centers at elevations to be determined but no greater than five feet vertical intervals. Repeat testing after supplementary compaction, removal and recompaction, etc., if any.

3.05 REMEDIAL WORK: Trenches shall have no noticeable settlement at end of warranty period. Carefully scarify top 12 inches of trenches with noticeable settlement and recompose, then fill to grade and compact.

END OF SECTION

SECTION 02500

STANDARDS FOR EXTERIOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide all standard work for exterior utility systems, complete, as shown on Drawings or inferable therefrom and/or as specified in accordance with requirements of the Contract Documents.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Manufacturer's Data: Submit catalog cuts and brochures for review prior to installation. The material shall cover items of standard manufacture. When requested, submit supplementary information such as test data, engineering calculations, etc., on materials or components provided.

1.03 QUALITY ASSURANCE: All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements. Comply with all applicable Codes.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 TRENCHING:

A. Trenches: Trenches shall be of the minimum width necessary for the proper installation of the conduit, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be graded to provide uniform bearing on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes or where overdepth excavation is required as hereinafter specified.

B. Backfilling: Trenches shall be backfilled to subgrade elevation in 8-inch loose thickness layers, and each layer shall be compacted to not less than 95 percent of maximum density.

C. Thrust Blocks: Shall be formed to sizes shown and bear against undisturbed earth or engineered fill.

3.02 TESTS: Perform all pressure testing, chemical testing, etc., as indicated in the respective Sections. Testing shall be performed by a recognized Testing Agency or witnessed by such an agency if the testing is performed by Contractor's own qualified staff.

3.03 DISPOSAL: Notify the Owner prior to removal of any materials off site.

END OF SECTION

SECTION 02510

WATER DISTRIBUTION

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide water distribution system, complete, as indicated on the Drawings or inferable therefrom and/or as specified in accordance with Contract Documents.

A. Alternate Bid: Conform to Section 01230. Quote an Alternate Bid amount for providing a ductile iron water piping system as specified herein in lieu of the PVC water piping system to be provided under the Base Bid. All other materials shall be as specified herein.

1.02 REFERENCES:

A. General: In addition to requirements shown or specified, comply with current applicable standards and specifications of the following organizations:

1. American Water Works Association (AWWA).
2. American Society of Testing and Materials (ASTM).
3. American Concrete Institute (ACI).
4. National Fire Code (NFC).
5. Standard Specifications for Public Works Construction (SSPWC).
6. National Sanitation Foundation (NSF).

B. Implement corrosion control recommendations specified in "Addendum I, Soil Corrosivity Study – Proposed Office Building and Parking Structure, Fox Studio lot, dated December 1, 2003.

1.03 SYSTEM DESCRIPTION: Work includes, but is not limited to, the following:

A. Excavation and backfill.
B. Bedding and installation of pipe, valves, fittings, fire hydrants, vaults, service lines, valve boxes, and all necessary appurtenances.
C. Removal and replacement of existing paving where required.

1.04 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit copies of manufacturer's specifications and installation instructions for each material. Include certification or other data verifying compliance with required characteristics. Indicate by transmittal form that copy of each has been distributed to the Installer.

B. Shop Drawings: Submit layout and Shop Drawings. Include details of reinforced concrete structures, and field conditions found to be contrary to those shown.

C. Test Reports: Submit certified Test Reports showing compliance of the following items in accordance with Section 01450.

1. Laboratory test for bedding and trench stabilization materials.
2. Concrete design mix.
3. Compression tests.
4. Water Test Reports: Submit results of water sample tests by State or local health authorities

1.05 DELIVERY, STORAGE, AND HANDLING: Prevent damage to materials during loading, transportation, and unloading. Store equipment with moving parts off ground on platforms or skids.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Materials and Workmanship: Shall conform to Standard Specifications for Public Works Construction (SSPWC) latest edition. Where more restrictive, those specifications shall supercede the specifications herein.

B. Polyvinyl Chloride Plastic (PVC) Pressure Pipe: Suitable for potable water distribution and manufactured in compliance with NSF standards.

1. Pipe sizes 1-1/2"– 3": ASTM D2241 with 160 psi minimum working pressure, unless otherwise indicated.

2. Pipe sizes 4" or greater: AWWA C-900 with 200-psi minimum working pressure, unless otherwise indicated.

a. Joints: ASTM D3139 elastomeric gasket bell ends, conforming to ASTM D2122 for bell measurements. The wall thickness of joint assembly shall be suitable to withstand internal pressures not less than pipe pressure class rating.

C. Alternate Bid Ductile Iron Piping: Ductile iron pipe shall comply with SSPWC, Section 207-9, shall be manufactured in accordance with AWWA C 151, and shall comply with SSPWC section 207-9.2.1. Provide joints, fittings, lining, coating, and encasement as specified below.

1. Joints: Mechanical joints manufactured in accordance with AWWA C 111 and shall comply with SSPWC Section 207-9.2.2.

2. Fittings: Mechanical joint fittings manufactured in accordance with AWWA C 110 and shall comply with SSPWC section 207-9.2.3.

3. Lining and Coating: Shall comply with SSPWC section 207-9.2.4.

4. Polyethylene Encasement for External Corrosion Protection: Shall comply with SSPWC 207-9.2.6.

D. Gate Valves: AWWA C-509, resilient seated and UL approved. Flanged, push-on rubber gasketed, or mechanical joints, as required. Valve stuffing boxes suitable for repacking with valve in fully opened position. Design working pressure of 200 psi.

E. Butterfly Valves: AWWA C-504, Class 150B valve construction. Provide flanged, or mechanical joint as required. Iron body, stainless steel shaft, ductile Ni-Resist iron disc with rubber seat. Fit valves with corrosion resistant, self-lubricating, sleeve-type bearings. 150 psi design working pressure. Direction of turning for valve opening shall be counter-clockwise.

F. Valve Boxes: 8" diameter by 12" galvanized top section (split) 20 gauge steel with 8" diameter PVC bottom section. Set valve box with top flush with finish ground or pavement surface. Provide cover with word "WATER" cast on top face. Fabricate to fit snugly to prevent displacement by traffic.

G. Cast Iron Frames and Covers: ASTM A48, Class 30B material. Non-rocking, heavy-duty castings of uniform quality, free from pockets, honeycombs, spots, cracks or other defects. Cast surfaces shall be smooth and coated with coal tar pitch varnish of best quality.

H. Fire Hydrants: Paint fire hydrants "OSHA Safety Yellow", Ameritone 719 or approved equal, after receiving a prime coat.

1. Fabricate of bronze material, James Jones J-3700 with gray iron, 6-inch nominal diameter hydrant extension, break-away grooves; flanged ends, gray iron 6-inch nominal diameter hydrant bury with top end flanged and bottom end having a mechanical joint connection. Flanges shall be 6-hole pattern.
2. Flanges and mechanical joint connections shall conform to ANSI/AWWA C110. Extensions and bury shall be cement-mortar lined per ANSI A21.4 (AWWA C104).
3. Combined length of bury and extension shall be as indicated. Where not indicated, install top of hydrant flange 3 inches above finished surface.
4. Connect hydrant flange to extension shall be as shown. Where not indicated, install top of hydrant flange 3 inches above finished surface.

I. Post Indicator: Two-part telescoping cast iron with target assembly and locking operating wrench, with tamperproof electrical supervisory switch for connection to tie in to the fire alarm control panel system. Traverse City No. A-240, Mueller A-20806, or approved equal.

J. All Other Materials: Manufacturer's standard for items required or type best suited for intended use.

PART 3 - EXECUTION

3.01 INSPECTION: Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.02 FIELD MEASUREMENTS: Verify dimensions before proceeding with Work. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for accuracy of such measurements and precise fitting and assembly of finished work.

3.03 TRENCHING: Comply with the applicable provisions of Section 306-1 of SSPWC. Excavation is not classified. Remove existing materials as required. Provide excavation to the required depths. Pile excavation material suitable for backfilling in orderly manner at sufficient distance from trench banks to avoid overloading, and to prevent slides or cave-ins. Dispose excavated materials not required or not suitable for backfill, off site. Provide grading necessary to prevent surface water from flowing into trenches or other excavations. Remove water accumulating in excavations. Provide sheeting and shoring as necessary for protection of work and for safety of personnel.

A. Trench Excavation: Excavate to necessary width for proper pipe laying. Make banks as nearly vertical as practicable. Excavate to 4 inches below bottom of pipe. Place, compact, and grade bedding material to provide uniform bearing and support of pipe.

B. Bell Holes and Depressions for Joints: After trench-bedding material has been graded, form to minimum length. Depth and width as required for properly making particular type of joint. Where rock or rubble excavation is required, excavate minimum over depth equal to 1/4 of outside pipe diameter, but not less than 4 inches. Backfill over depth excavation with bedding material.

C. Unsuitable Soil: Except for authorized over depths, do not excavate below depths indicated. Whenever soil in bottom of trench is wet, unstable, or otherwise incapable of properly supporting pipe, as determined by the Engineer, remove such soil to depth required and backfill trench to proper grade with bedding material.

D Excavation for Appurtenances: Excavate for manholes and similar structures to leave at least 12 inches clear between outer surfaces and embankment or supports used to hold and protect banks. Fill unauthorized over depth excavation below such appurtenances with concrete.

3.04 INSTALLATION

A. Pipe Laying: Inspect pipe for cracks or other defects before installation. Do not use defective damaged or unsound pipe. Remove foreign matter from pipe interior before lowering into trench. Keep work clean and prevent water, earth or other substances from entering pipes or fittings. Do not lay pipe in water or when trench or weather conditions are unsuitable for work. Start laying at lowest point and lay pipe sections with spigot or tongue pointing in direction of flow. Lay pipe true to line and grade to form smooth and uniform invert. Place pipe with uniformly distributed bearing for bottom quarter of pipe. Excavate recesses to accommodate pipe bells, sleeves, glands or other fittings. Do not allow cinders, loam, humus, or brickbats to come in contact with pipe, valves, or fittings. Take up and re-lay pipe that has grade or joint disturbed after laying.

B. Curves and Offsets: Do not exceed pipe manufacturer's recommendations for deflections from straight line or grade, between extended center lines of 2 connecting pipes as made necessary by curves or offsets. If alignment requires deflections in excess of pipe manufacturer's recommendations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limit set forth, as authorized by Engineer.

C. Pipe Joints: Provide in accordance with manufacturer's recommendations. If required by the Architect, Contractor shall arrange for manufacturer's representative be present at start of pipe laying operations to instruct Contractor's workmen in proper methods to be employed. Obtain full contact between joined surfaces and keep each joint clean so that joint is not damaged or displaced. After joint is installed, immediately coat exposed bolt threads with bituminous compound.

D. Anchorage: Provide bends and tees with tie rods and clamps, and anchor by blocking with concrete against undisturbed earth. Form concrete anchors and thrust blocks as indicated.

E. Installation of Valves: Install and set plumb. Clean interiors; remove foreign matter before installation. Tighten stuffing boxes and inspect valves in opened and closed positions to see that all parts are in working condition.

F. Connections to Existing Mains: Provide in accordance with requirements of agency owning main. Contractor shall obtain permits and pay fees for such work. Make connections between new piping and existing mains by using special sections and fittings as required to suit actual conditions

G. Installation of Fire Hydrants: Clean the interior to remove foreign matter before installation. Tighten stuffing boxes and inspect fire hydrants in opened and closed positions, to see that all parts are in working condition. Set plumb, on and against concrete blocking. Set back of fire hydrants, opposite pipe connections, against vertical face of concrete thrust blocks. Surround fire hydrants drain holes with minimum 9 cubic feet of 1/2 inch to 3/4-inch clean crushed stone or gravel. Thoroughly compact backfill around fire hydrants to grade line.

H. Sewer Line Crossing:

1. Normal Conditions: Lay water mains over sanitary sewers to provide vertical separation minimum three-foot clearance.

2. Unusual Conditions: If above separation cannot be met, use the following:

a. Sewer less than three feet under water main: The sewer shall have no joints within 4-feet of the waterline. Sewer pipe encased in 6 inches concrete around pipe, and extend 4-feet either side of water main.

3.05 ALTERNATE BID - INSTALLATION OF DUCTILE IRON PIPING: Comply with SSPWC Section 306-1.2. The ductile iron pipe shall not be placed partially in contact with concrete such as thrust blocks; use polyethylene encasement to prevent such contact. Electrically insulate underground ductile iron pipe from dissimilar metals and above ground iron pipe with insulating joints. Bond all non-conductive type joints for electrical continuity per NACE International Standard RP-0286-86.

3.06 METER VAULT AND VALVE BASINS:

A. Concrete Work: Provide concrete structures in accordance with sections, profiles, shapes and sizes indicated. Proportions, quality, sampling, testing, mixing, formwork, placing, finishing, protection, curing and workmanship shall comply with ACI 301. Concrete shall be air entrained, and made from Type II or Type IIA Portland cement.

B. Precast Concrete Construction: Provide precast units completely fabricated at factory. No chipping and patching allowed at job site. Form tight joints between precast sections with rubber gasket, cement mortar, or bituminous material. Scrape off refuse mortar, inside and outside, before it has time to harden. Paint outside joints with coal tar pitch before backfilling.

C. Cast Iron: Paint fire hydrants "OSHA safety yellow" Ameritone 719 after receiving a prime coat.

D. Covers and Frames: Set in 1-inch thick mortar bed with top flush with finished grade.

E. Pipe Penetrations: Provide standard weight pipe sleeves for pipe passing through vault walls or roof. Provide sleeve size minimum 6 inches larger than main pipe. Pack angular space between pipe and sleeves with oakum to within 1 inch of sleeve ends and fill remaining spaces with asphaltic mastic.

3.07 BACKFILLING:

A. Backfilling in Pipe Zone: Do not backfill until required tests are performed. Deposit bedding in pipe zone in 6-inch maximum layers to minimum height of 12 inches above pipe. Thoroughly compact layers to Standard Proctor density of 90%.

B. Backfilling Trenches Under pavement In Silt or Clay Soil: In areas such as roadways, walks, and parking lots, backfill trenches above pipe zone with uniformly graded granular material. Place backfill in 6-inch layers and compact each layer to density of adjacent soil. Compact upper 3 feet to 95% of maximum density.

C. Backfilling Trenches Under Lawns: Unless otherwise indicated, place remainder of backfill above pipe zone in 12-inch layers and compact each layer to density of adjacent soil. Leave trench surface mounded in uniform and neat condition. Reopen trenches improperly backfilled to depth required for proper compaction; refill and compact as specified. Re-sod removed or damaged grassed areas with sod matching adjacent grass.

D. Removal and Restoration of Existing Pavement and Base: Remove to neat lines and keep extent of removal to minimum to accomplish required Work. Saw cut edges. Where pavements, curbs, gutters, and sidewalks are removed or damaged, replace with materials and construction to match existing work.

3.08 FIELD QUALITY CONTROL:

A. Piping System Leak Tests: Provide labor and test equipment including test pumps, gauges, instruments and other equipment required. Use test quality pressure gauges with range of approximately twice test pressure. Use calibrated gauges and instruments.

1. Piping: General: Remove equipment subject to damage by test pressure from systems during testing. Replace removed equipment after testing. Systems may be tested in sections as work progresses; however, previously tested portion shall become part of later test of composite system. Correct leaks by remaking joints with new material. Test time accrues only while full test pressure is on system. Test before backfilling, concealing, insulating, or making connections to potable water system.

a. Testing of the newly laid piping or any valved section of piping shall be accomplished after the lines are laid, the joints and accessories installed, and the trench partially backfilled, leaving the joint exposed for examination. The piping shall be subjected for a minimum of two hours to a pressure of one and one-half times the working pressure, but in no case less than 150 pounds per square inch. Examine all exposed pipe, joints, fittings and accessories during the test period. Replace or repair defective portions of the system, and repeat tests until results are satisfactory. Allowable leakage shall be as specified in AWWA C-600, Table 3.

2. Buried Pipe Wrapping and Coating: Test surfaces with standard 8,000 to 10,000 volt electrical holiday detector.

3.09 CLEANING:

A. Sterilization: Sterilize potable water systems per requirements of public health agency having jurisdiction. If Health Department does not have specific requirements, use the following:

1. Alternative Procedure: Sterilize domestic water systems with 4% chlorine solution injected into system to concentration of 50 parts per million and allow to stand for 24 hours. After this period, purge throughout entire structure at outlets; reduce system chlorine content to less than 1 part per million.

B. Warning Signs: Provide signs at outlets during chlorination.

C. Flushing: The new mains shall be flushed prior to connection to the existing mains after the pressure tests are made. Minimum flushing velocity will be 5 feet per second. During flushing operation, all valves shall be opened and closed several times. Water samples from the newly installed mains shall be submitted to the local and State health authorities as required for approval.

END OF SECTION

SECTION 02530

SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. The Work includes, but is not limited to, the following:

A. Excavation and backfill.
B. Bedding and installation of sanitary sewer pipe, fittings, and appurtenances.
C. Removal and replacement of existing paving where required.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit copies of manufacturer's specifications and installation instructions for each material. Include certification or other data verifying compliance with required characteristics. Indicate by transmittal form that copy of each has been distributed to the Installer.

B. Test Reports: Submit certified Test Reports showing compliance of the following items.

1. Laboratory test for bedding and trench stabilization materials.
2. Compression tests.

1.03 QUALITY ASSURANCE:

A. Standard Specifications: All work shall be performed and materials shall be used in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements. Contractor shall have one copy of the Standard Specifications at the job site. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and payment sections in Standard Specifications do not apply to this document.

PART 2 - PRODUCTS

2.01 MATERIALS: Materials and workmanship shall conform to the Standard Specifications for Public Works Construction (SSPWC) latest edition. Where more restrictive, those SSPWC specifications shall supersede the specifications herein.

A. PVC Pipe: Pipe shall have flexible, gasketed, push-on joints and be PVC (polyvinyl chloride) SDR 35 conforming to ASTM D3034. Fittings shall be factory molded of PVC. All pipe and fittings shall be legibly and permanently marked with type and class.

B. Vitrified Clay Pipe (VCP): Shall conform to SSPWC sections 207-8 and 306-1.2

C. All Other Materials: Manufacturer's standard for items required or type best suited for intended use.

PART 3 - EXECUTION

3.01 INSPECTION: Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.02 FIELD MEASUREMENTS: Verify dimensions before proceeding with Work. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for accuracy of such measurements and precise fitting and assembly of finished work.

3.03 TRENCHING:

A. General: Comply with applicable provisions of Section 306-1 of SSPWC. Remove existing materials as required. Provide excavation to required depths. Pile excavation material suitable for backfilling in orderly manner at sufficient distance from trench banks to avoid overloading, and to prevent slides or cave-ins. Dispose excavated materials not required or not suitable for backfill, off site. Provide grading necessary to prevent surface water from flowing into trenches or other excavations. Remove water accumulating in excavations. Provide sheeting and shoring as necessary for protection of work and for safety of personnel.

B. Trench Excavation: Excavate to necessary width for proper pipe laying. Make banks as nearly vertical as practicable. Excavate to 4 inches below bottom of pipe. Place, compact, and grade bedding material to provide uniform bearing and support of pipe.

C. Bell Holes and Depressions for Joints: After trench bedding material has been graded, form to minimum length, depth and width as required for properly making particular type of joint. Where rock or rubble excavation is required, excavate minimum overdepth equal to 1/4 of outside pipe diameter, but not less than 4 inches. Backfill overdepth excavation with bedding material.

D. Unsuitable Soil: Except for authorized overdepths, do not excavate below depths indicated. Whenever soil in bottom of trench is wet, unstable, or otherwise incapable of properly supporting pipe, as determined by the University Representative, remove such soil to depth required and backfill trench to proper grade with bedding material.

3.04 INSTALLATION:

A. Pipe Laying: Inspect pipe for cracks or other defects before installation. Do not use defective damaged or unsound pipe. Remove foreign matter from pipe interior before lowering into trench. Keep work clean and prevent water, earth or other substances from entering pipes or fittings. Do not lay pipe in water or when trench or weather conditions are unsuitable for work. Start laying at lowest point and lay pipe sections with spigot or tongue pointing in direction of flow. Lay pipe true to line and grade to form smooth and uniform invert. Place pipe with uniformly distributed bearing for bottom quarter of pipe. Excavate recesses to accommodate pipe bells, sleeves, glands or other fittings. Do not allow cinders, loam, humus, or brickbats to come in contact with pipe, or fittings. Take up and re-lay pipe that has grade or joint disturbed after laying.

B. Curves and Offsets: Do not exceed pipe manufacturer's recommendations for deflections from straight line or grade, between extended center lines of 2 connecting pipes as made necessary by curves or offsets. If alignment requires deflections in excess of pipe manufacturer's recommendations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limit set forth, as authorized by the Architect.

C. Pipe Joints: Provide in accordance with manufacturer's recommendations. If required by the Architect, Contractor shall arrange that manufacturer's representative be present at start of pipe laying operations to instruct Contractor's workmen in proper methods to be employed.

D. Anchorage: Provide bends and tees with tie rods and clamps, and anchor by blocking with concrete against undisturbed earth.

E. Connections to Existing Mains: Make connections between new piping and existing mains by using special sections and fittings as required to suit actual conditions

F. Water Line Crossing:

1. Normal Conditions: Lay sanitary sewers under water mains to provide vertical separation minimum three foot clearance.

2. Unusual Conditions: If above separation cannot be met, use the following:

a. Sewer Less Than 3-Feet Under Water Main: The sewer shall have no joints within 4-feet of the waterline. Sewer pipe encased in 6 inches concrete around the pipe, and extend 4-feet either side of water main.

b. Sewer Mains Passing Under Water: If vertical separation is less than 18 inches, provide structural support for water.

3.05 BACKFILLING:

A. Backfilling in Pipe Zone: Do not backfill until required tests are performed. Deposit bedding in pipe zone in 6-inch maximum layers to minimum height of 12 inches above pipe. Thoroughly compact layers to Standard Proctor density of 95% in accordance with ASTM D-1557.

B. Backfilling Trenches Under Pavement in Silt or Clay Soil: In areas such as roadways, walks, and parking lots, backfill trenches above pipe zone with uniformly graded granular material. Place backfill in 6-inch layers and compact each layer to density of adjacent soil. Compact upper 3 feet of backfill to 95% of maximum density.

C. Removal and Restoration of Existing Pavement and Base: Remove to neat lines and keep extent of removal to minimum to accomplish required Work. Saw cut edges. Where pavements, curbs, gutters, and sidewalks are removed or damaged, replace with materials and construction to match existing work.

3.06 FIELD QUALITY CONTROL:

A. Piping System Leak Tests:

1. General: Provide labor and test equipment including test pumps, gauges, instruments and other equipment required. Use test quality pressure gauges with range of approximately twice test pressure. Use calibrated gauges and instruments.

2. Piping:

a. General: Remove equipment subject to damage by test pressure from systems during testing. Replace removed equipment after testing. Systems may be tested in sections as work progresses; however, previously tested portion shall become part of later test of composite system. Correct leaks by remaking joints with new material. Test time accrues only while full test pressure is on the system. Test before backfilling, concealing, insulating, or making connections to sewer system.

b. Testing of the newly laid piping or any valued section of piping shall be accomplished after the lines are laid, the joints and accessories installed, and the trench partially backfilled, leaving the joint exposed for examination. The piping shall be tested in accordance with Section 306-1.4 of the SSPWC. Examine all exposed pipe, joints, fittings and accessories during the test period. Replace or repair defective portions of the system, and repeat tests until results are satisfactory.

END OF SECTION

SECTION 02620

SUBDRAIN SYSTEM

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide perimeter foundation drains, under slab drains, and shoring wall drain systems.

1.02 QUALITY ASSURANCE: All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.

PART 2 - PRODUCTS

2.01 A. Pipe: Shall be Schedule 40 PVC conforming to ASTM D2665-89A or equal. Perforated pipe shall have either round or slotted perforations. Perforations shall be shop drilled.

A. Perforated PVC Drain Pipe: Shall conform to the provisions of ASTM D2729. Provide two rows of 3/8-inch perforations at 6-inch on center.

B. Filter Fabric: Shall be Mirafi 140 N or equal.

C. Soil Materials: Gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations thereof conforming to Section 300-3.5.2 of the Standard Specifications.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Pipe: Shall be installed in conformance with Section 306 of the Standard Specifications.

B. Backfill: Shall be placed and compacted in accordance with Section 306-1.3 of the Standard Specifications and shall comply with recommendations of the project soils report.

END OF SECTION

SECTION 02630

STORM DRAINAGE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide storm drainage pipe and drainage structures.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Submittal: Contractor shall submit Shop Drawings and/or manufacturers' product information for the catch basins and piping to the Owner's Representative for approval.

1.03 QUALITY ASSURANCE: All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Drainage Pipe: Shall conform to Section 207-17 of the Standard Specifications. Drainage pipe shall have flexible, gasketed, push-on joints and be PVC (polyvinyl chloride) SDR 35 conforming to ASTM D3034. Fittings shall be factory molded of PVC. All pipe and fittings shall be legibly and permanently marked with type and class.

B. Catch Basins: Shall be sized as indicated on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Trench Excavation: Excavate to depths required in conformance with Section 306-1 of the SSPWC. Confine excavation to work limits.

B. Piping: Install to manufacturer's recommendations, continuously upgrade. Bell ends face upgrade. Prior to making joints, clean and dry surfaces. Use lubricants in conformance with the pipe manufacturer's recommendations for insertion of pipe in joint. Set pipe in position and check line and grade. Keep dirt from entering exposed pipe ends. Make joints watertight.

3.02 BACKFILLING: Do not backfill until required tests are performed and the piping systems conform to requirements specified herein.

3.03 TESTS: Inspect storm drain in accordance with Section 306-1.4 of the SSPWC and test for leakage per 306-1.4.2 (water exfiltration test).

END OF SECTION

SECTION 02711

GRANULAR BASE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide granular base in accordance with the Contract Documents.

A. Work Included:

1. Prepare finished surface of subgrade.
2. Furnishing and placing courses of aggregate in conformance with lines, grades, and typical sections indicated in Details and Drawings.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Test Reports: Submit certified Test Reports showing compliance of the aggregate.

1.03 QUALITY ASSURANCE:

A. Standard: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following: AASHTO - "American Association of State Highway and Transportation Officials".

B. Testing Agency: The Owner will engage, at its own expense, a Testing Agency to inspect compaction operations, to perform tests specified, and to submit reports to the Owner's Representative.

PART 2 - PRODUCTS

2.02 MATERIALS:

A. Aggregate: Conform to following gradation tests.

1. Road Base, percent by weight passing square mesh sieves: 1-1/2 inch 100; 1 inch 100; 3/4 inch 95-100; Number 4 30-70; Number 200 3-15.
2. Sieve Analysis - ASTM C136.
3. Wear Abrasion - ASTM C131.
4. Liquid Limit not to exceed 30, in accordance with AASHTO T89.

B. All Other Materials: Manufacturer's standard to the items required or type best suited for the intended use.

PART 3 - EXECUTION

A. Subgrade Preparation: Shape and compact to crown, line, and grades indicated on the Drawings before placing base material. Compact in accordance with Section 02312 - Earthwork for Grading and Paving.

B. Base Course: If compacted depth of aggregate base course exceeds 6 inches, construct in two or more layers of approximately equal thickness. Maximum compacted thickness of any one layer shall not exceed 6 inches. When vibratory or other types of special compacting equipment are used, compacted depth of single layer may be increased to 8 inches.

C. Compaction: Compact each layer to 95 percent AASHTO T180. Maintain the surface of each layer during compaction operations so that uniform texture is produced and aggregates are firmly keyed. Apply water uniformly during compacting to control moisture content to within 2 percent of optimum.

D. Thickness of Aggregate Base Course: Not less than 1/4 inch from typical section dimension.

E. Testing: Prepared surface upon which surface course is to be placed shall be tested with 10 foot straight edge, or other device. Surface shall be true prior to application of any primer or pavement. Variation surface will not exceed 1/2 inch. Rework areas not complying with these tolerances. Surface shall be maintained in satisfactory condition.

END OF SECTION

SECTION 02721

BASE COURSE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. The work includes constructing base course beneath all new pavement.

1.02 STANDARD SPECIFICATIONS:

A. All work of this Section shall be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.

B. The Contractor shall have one copy of the Standard Specifications at the job site.

C. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections, and the measurement and payment sections do not apply to this document.

PART 2 - PRODUCTS

2.01 BASE COURSE: Shall conform to the requirements for crushed miscellaneous base as specified in Section 200-2.4 of the Standard Specifications.

PART 3 - EXECUTION

3.01 INSTALLATION: Base course shall be placed and compacted in conformance with Section 301-2 of the Standard Specifications.

END OF SECTION

SECTION 02741

PAVING AND SURFACING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section Provide paving and surfacing in accordance with the Contract Documents.

A. Related Work:

1. Section 02312 Earthwork for Grading and Paving: Excavation and backfill.
2. Section 07920 Joint Sealants: Horizontal surface sealants.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings and Product Data: Submit for Work of this Section.

B. Test Reports: Submit certified Test Reports showing compliance of the following items:

1. Design mix in accordance with Section 03300 Cast-in-Place Concrete.

1.03 QUALITY ASSURANCE

A. Testing Agency: Refer to Section 02312 Earthwork for Grading and Paving.

B. Mock-up: Refer to Section 01330 Submittals where scope and description for mock-up are given.

1.04 PROJECT CONDITIONS

A. Environmental Requirements: Perform cold weather concreting in accordance with the applicable requirements of Section 03300 Cast-in-Place Concrete.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Concrete Materials: Use materials as specified in Section 03300 Cast-in-Place Concrete to obtain a strength of 3000 pounds per square inch at 28 days subject to the following modifications.

1. Aggregates -- ASTM C33, size 467.
2. Admixtures -- Air entraining admixture.
3. Slump -- Maximum 3 inches.

B. Form Material: Comply with applicable requirements of Section 03100 - Concrete Formwork.

C. Form Oil: Suitable for type of forms used and conditions of use.

D. Base Course Aggregates: ASTM C33, crushed stone or crushed gravel.

E. All Other Materials: Manufacturer's standard for items required or type best suited for intended use.

2.02 FABRICATION:

A. Extruded Concrete Curbs: Provide extruded concrete curbs accurately formed and finished, of size and shape detailed, and reinforced as required. Award Work to a manufacturer regularly engaged in production of extruded concrete curbs.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examination: Examine substrates, adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. Surface Preparation: Do necessary final excavating and filling to prepare finished sub-grade. Building up of subgrade under forms after they are in place will not be permitted. After forms are in place, test subgrade with template, reduce high spots to grade and raise low spots to grade with materials compacted in place by tamping.

3.03 INSTALLATION:

A. Base Course

1. Construct base course in layers not more than 4 inches (compacted) in thickness. Deposit aggregate directly on prepared subgrade or preceding layer of compacted aggregate. Keep placed material free from segregation. Compact each layer of material with tamping roller, with pneumatic tired roller, with vibration machine, or with combination of the three.

2. If subgrade material is worked into base course material during compacting or finishing operations, remove base course material within affected area and replace with new aggregate. Restrict hauling over completed or partially completed work when subgrade is soft or there is tendency for subgrade material to work into base course material.

3. Compact each layer with aid of water. Provide sufficient moisture to prevent segregation into pockets of fine and coarse material.

B. Placing Concrete:

1. Set forms carefully to alignment and grade, and hold rigidly in place. Clean forms thoroughly each time they are used and coat with form oil to prevent concrete from adhering.
2. Deposit concrete on base course in successive batches in manner as to require as little rehandling as possible and distribute to such depth that finished slab thickness will be obtained at all points.
3. Thoroughly mix concrete that becomes segregated from main body of batch during the process of spreading. Provide for continuous depositing and spreading of concrete between expansion joints.

C. Concrete Paving:

1. Finish the surface to grade and cross-section by suitable floats. After floating, trowel as required to produce smooth, dense surface and finish with coarse pushbroom drawn over concrete surface. Before final finish, check the surface of paving and eliminate irregularities of more than 1/8 inch in 10 feet.
2. Provide transverse expansion joints as indicated and where curbs are adjacent to walks. Provide expansion joints where pavement abuts other structures.

D. Concrete Curbs:

1. Maintain forms for back of curbs in place until the face and top of the curb have been rubbed and finished.
2. Place concrete in the forms in 6 inch layers and thoroughly consolidate by tamping and spading so that there are not rock pockets at forms and mortar entirely covers the top surfaces. Edge surface of top of curb with proper edging tool. Immediately after removing front curb form, rub exposed curb surfaces with wood or concrete rubbing block and water to uniform texture. Make exposed surfaces of finished curb true and straight and curb top surface of uniform width, free from humps, sags, or other irregularities. Surface shall not vary more than 1/8 inch in 10 feet except at grade changes or curves. Maintain visible surfaces and edges of finished curb free of blemishes, form and tool marks and uniform in color, shape and appearance.
3. Provide expansion joints and control joints constructed at right angles to line of curbs, as shown.
   a. Construct control joints by placing 1/8-inch thick steel separators, of cross section of top and face of curb, directly opposite control joints in abutting concrete pavement or walk. Remove separators as soon as practicable after the concrete has been struck off, consolidated, and set sufficiently to preserve joint width and shape. After separator plates are removed, round the exposed edges of joints with acceptable edging tool.
   b. Provide expansion joints in curbs at the ends of returns and directly opposite the expansion joins of abutting concrete pavement. Where curbs do not abut concrete pavements, place expansion joints at intervals not exceeding 40 feet except as otherwise indicated. Provide dowels and metal sleeves in expansion joints.

E. Extruded Concrete Curbs: Provide extruded concrete curbs at location indicated. Anchor in place with dowels set in pavement and extending to mid-height of curb. Center dowels in curb and place not to exceed 10 feet on center.

F. Curing and Protection: Immediately after finishing operations, cure and protect exposed surfaces of concrete in accordance with ACI, moist cure.

3.04 ADJUSTING AND CLEANING: Protect completed work from damage until accepted. Repair or replace sections that are damaged or defaced during construction operations.

END OF SECTION

SECTION 02745

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide asphaltic concrete paving in accordance with Contract Documents.

1.02 QUALITY ASSURANCE: All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements.

A. Testing Agency: Owner will engage, at its own expense, Testing Agency to inspect asphaltic concrete paving, to perform tests specified, and to submit reports to the Architect in accordance with Section 01450.

1.03 PROJECT CONDITIONS:

A. Environmental Requirements: Do not install asphaltic concrete pavement mixture on wet surfaces or when temperature is below 40 degrees Fahrenheit.

PART 2 - PRODUCTS

2.01 MATERIALS: Provide materials in accordance with SSPWC requirements unless otherwise noted.

A. Aggregate Base Course: SSPWC Section 200-2.2 and 301-2.

B. Asphalt Prime and Tack Coat: SSPWC Section 302-5.2, 302-5.3 and 302-5.4.

C. Asphaltic Concrete: SSPWC Section 203-6.

D. Asphalt Tack Coat: Provide in accordance with SSPWC Section 302-5.3.

E. All Other Materials: Shall be manufacturer's standard for the items required or type best suited for the intended use.

PART 3 - EXECUTION

3.01 CLEANING: After completion of paving operations, thoroughly clean the paved areas by sweeping or washing and remove defacements or stains. Exercise care to avoid soiling of adjacent construction. Remove such soiling prior to final acceptance of Work.

3.02 PROTECTION: Protect finished surfaces against blemishes and disfigurement.

3.03 RESTRICTION: Do not permit vehicular traffic on finished pavement until it has hardened sufficiently, and in no case less than 36 hours after completion.

END OF SECTION

SECTION 02754

CONCRETE CURB, GUTTER, AND DRIVEWAYS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. The Work includes installation of concrete curb and gutter, and driveways.

1.02 QUALITY ASSURANCE: All Work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Portland Cement: ASTM C150, type II, low alkali.

B. Aggregates: ASTM C33, from approved source to insure uniform quality and grading. Deliver so that moisture content variations will not decrease production of reasonably uniform concrete. Do not use aggregates that are reactive with alkalis.

PART 3 - EXECUTION

3.01 INSTALLATION: Construct all the site concrete of 3,000 psi concrete unless otherwise indicated or specified. Provide reinforcing bars or mesh where indicated. Form accurately to profiles shown, using wood, metal or plastic forms as approved. Place and handle concrete in a manner that will avoid segregation of ingredients. Provide expansion and control joints as required.

A. Driveways: Light broom finish perpendicular to longitudinal direction of the walk. Score walks in direction and pattern indicated per details.

B. Gutters: Light broom finish with 3 inch wide steel trowel finish at flow lines.

C. Curbs: Steel trowel finish, followed by fine hair brush finish.

D. Curing: Concrete work shall be properly cured and protected against injury and defacement of any nature during construction operations. If weather is hot or surface has dried out, spray surface with fine mist of water, starting not later than 2 hours after final troweling. Surface of finish shall be kept continuously wet for 10 days. Wetting shall be performed on weekends and holidays if needed. In lieu of water curing, within 24 hours after finishing, the concrete may be cured with an approved clear liquid curing compound, applied in accordance with the manufacturer's recommendations.

E. Flood Test: All concrete curbs and gutters and driveways shall be given a flood test. All concrete work where water ponds and does not run off in a reasonable amount of time, shall be removed to the nearest score or join line and replaced to provide proper drainage.

END OF SECTION

SECTION 02755

SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide portland cement concrete site walks and paving. Concrete curbs, gutter, and driveways are specified in Section 02754.

1.02 QUALITY ASSURANCE: All work shall be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements.

A. Concrete Manufacturer: Furnish concrete from a licensed commercial ready-mix concrete plants conforming to ASTM C94 and approved by Building Official.

B. Source Quality Control: As specified in Section 03300.

C. Concrete Mix Designs: As specified in Section 03300.

PART 2 - PRODUCTS

2.01 MATERIALS: Furnish materials conforming to and meeting the test requirements of Section 03300, as applicable. Air entrainment in concrete is at Contractor's option.

A. Color Admix: Same product as is approved under Section 03350.

B. Concrete Mixing: Furnish ready-mixed concrete from an approved commercial off-site plant.

C. Slump: Adjust quantity of water so concrete at time of placing does not exceed 3" for walks and paving.

PART 3 - EXECUTION

3.01 PREPARATION FOR CONCRETE PLACING: Remove all free water from forms before concrete is deposited. Remove hardened concrete, debris, and foreign materials from forms and from surfaces of mixing and conveying equipment. Wet wood forms, and wet other materials adequately to reduce the suction and maintain concrete workability. Lightly dampen subgrade 24 hours before placing concrete but do not muddy. Re-roll as required for smoothness and remove loose material.

3.02 SITE CONCRETE WORK: Use bituminous type joint filler. Cure all concrete for at least 10 days with liquid curing compound, sheet material, or water. Construct all site concrete of 3,000 psi concrete. Provide reinforcing bars or mesh only where indicated, materials conforming to Section 03200. Conform to requirements specified in Section 03300 for bituminous joint filler, and to Section 03350 for slab and walk finishing and curing; and integrally-colored concrete paving.

END OF SECTION

SECTION 02762

PAVEMENT MARKING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide pavement paint marking and striping, complete.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Manufacturer's Data: Submit manufacturer's technical Product Data covering the recommended preparation and application methods with paint coverage rates.

1.03 QUALITY ASSURANCE: All materials shall comply with the current rules and regulations of the local air quality management district, with the rules regarding volatile organic compounds, and with FDA rules and regulations for dangerous materials in paint.

PART 2 - PRODUCTS

2.01 PAINT: Shall be manufactured for pavement line markings, and conform to Federal Standard 595B and bear approval of SCAQMD.

PART 3 - EXECUTION

3.01 GENERAL: All surfaces to be marked shall be thoroughly cleaned before application of the paint. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40°F and less than 95°F. Maintain paint temperature within these same limits. Paint shall be applied to clean, dry surfaces. Paint shall be applied pneumatically with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined. Lines shall be straight, or curved as applicable, to within 1/4" in 15 feet. Greater deviations shall be removed or obliterated and lines reapplied.

A. Layout: Striping indicated on Drawings is indicative of quantity and type required.

B. Existing Pavement: Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Where oil or grease are present on old pavements to be marked, affected areas shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint.

C. Application: Paint shall be applied evenly to the pavement surface to be coated at a rate of 105 plus or minus square feet per gallon. Apply two coats minimum or more if required to obtain complete opacity. Dry film thickness shall be 10 mils minimum.

D. Cleanup: Remove paint droppings and overspray, and repair all injured or stained surfaces as approved.

END OF SECTION

SECTION 02765

PAVEMENT TACTILE WARNINGS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide detectable warnings in pedestrian walkways.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Submit Shop Drawings showing layout for each detectable warning area involved; include Product Data and Samples.

1.03 QUALITY ASSURANCE: All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements, and ADA requirements.

PART 2 - PRODUCTS

2.01 MATERIALS: Conforming to Section 02755, Site Concrete Work, and requirements herein.

PART 3 - EXECUTION

3.01 DETECTABLE WARNINGS: Provide detectable warnings on all exterior walking surfaces and at hazardous vehicular areas, and at interior areas which are hazardous for pedestrians. The detectable warnings shall consist of raised truncated domes with a diameter of nominal diameter of 0.9", a height of nominal 0.2", and a center-to-center spacing of nominal 2.35" and shall contrast with adjoining surfaces, either light-on-dark or dark-on-light. The material used to provide contrast shall be an integral part of the walking surface; for exterior surfaces, units shall be completely weatherproof and, where subject to vehicles, shall not be damaged by the traveling vehicles. Detectable warnings for use on interior surfaces shall differ from adjoining walking surfaces in resiliency or sound-on-cane contact. If a walk crosses or adjoins a vehicular way, and the walking surfaces are not separated by curbs, railings, or other elements between the pedestrian areas and vehicular areas, the boundary between the areas shall be defined by a continuous detectable warning which is 36" wide, complying with the above requirements. Warning units and area unit installations shall conform to ADA requirements.

END OF SECTION

SECTION 02784

PAVER-PEDESTAL SYSTEM

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide system of precast concrete pavers supported on standard product manufactured pedestal system over roofing on a concrete deck, complete.

A. Related Work:

1. Concrete deck construction.
2. Roofing system on concrete deck.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit pedestal manufacturer's complete data and directions for preparation, precast concrete paver manufacture, and data and instructions for installation of pedestal system.

B. Shop Drawings: Submit showing dimensioned layout of pedestal locations, and details of assembly and installation of pedestals including leveling adjustment.

C. Samples: Submit two Samples of precast concrete pavers for approval of appearance.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements: Paver-pedestal system shall conform to governing Building Code.

B. Installer Qualifications: Installer for Work of this Section shall be experienced in installation of the system or shall be employees of the paver-pedestal system manufacturer.

1.04 DELIVERY AND STORAGE: Deliver precast concrete pavers on pallets or equivalent, with protection between pavers to prevent damage or defacing. Deliver pedestal materials in manufacturer's original factory boxes or cartons. Do not store upon the existing roofing system

1.05 PROJECT CONDITIONS: Protect existing roofing from damage during installation of paver-pedestal system by providing temporary plywood panels or equivalent to support precast pavers and distribute loads over areas which prevent damage or displacement of existing roofing.

1.06 WARRANTY: Conform to Section 01790. Manufacturer shall warrant pedestal system materials for 5 years against defective products and Contractor shall warrant the installation of the paver-pedestal system for 5 years against defective installation or failure, and to replace defective precast concrete pavers, during the warranty period, including temporary removal of satisfactory paver and pedestal materials as required to perform repairs or replacements under the warranties.

1.07 EXTRA MATERIALS: Conform to Section 01770. Deliver to the Owner 10 precast concrete pavers with sufficient pedestal materials to install the pavers, in labeled cartons or boxes. Store where and as directed.

PART 2 - PRODUCTS

2.01 MANUFACTURE:

A. Pedestal System: "Pave-El Pedestal System" manufactured by Envirospec, Inc., Buffalo, NY, phone 716/689-8548, fax 716/689-7309, complete with all required pedestal units, leveling devices, and accessories.

B. Precast Concrete Pavers: Units shall be precision manufactured of concrete having minimum 3,000 psi compressive strength at 28 day age, 18" square, by minimum 2" thickness. Top surface shall have a non-slip texture meeting code slip-resistance requirements produced by broom or other method as standard with the unit manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION: Examine existing roofing in place for damage or defects of any kind before starting Work of this Section and notify the Contractor of all needed repairs or corrections.

3.02 PREPARATION:

A. Tests: Perform suitable tests to verify the existing roofing will not be damaged or displaced by the weight of the paver-pedestal system by erecting a sample area on the roof deck during warm weather conditions. Leave in place for sufficient time to assure that all settlement and/or displacement of roofing, if any, has occurred. If damage or displacement occurs, provide additional support under the pedestals to adequately distribute the loads; use minimum 1/4" thick APOC roofing protection course panels cut to needed sizes, and repeat the test until no damage or displacement of the roofing occurs.

B. Cleaning: Sweep existing roofing and roof deck clean and remove all objects which may damage the roofing if located under a pedestal.

3.03 INSTALLATION: Precisely layout pedestal locations in accordance with the Shop Drawings. Include additional support under pedestal bases as required by tests. Locate first row of pavers at an exterior edge of the roof deck using 1/2 pedestals at edges and pedestals at corners or partial angles locations. Place pedestals with projecting ribs pointing up to assure uniform paver joint spacing. Place pavers tight to spacers to ensure an even spacing. Place pacers by lowering horizontally, not by "nosing in". Align and shim pavers as the installation progresses. Run subsequent paver rows parallel to the first row. Where multiple stacking of pedestals is required, locate leveling plates on top of upper pedestal, never between or below pedestals. Use leveling plates as needed to bring finished paver installations to a true plane free of offsets. At deck perimeter and around protrusions through the pavers where it is not practical to cut pavers to fit, fill the void with approved coarse river-run rounded gravel.

3.04 CLEANING UP: Conform to Section 01740. Remove all debris, waste, surplus materials, and tools from the site and Owner's property and legally dispose of all waste. Leave paver deck clean and ready for use.

END OF SECTION

SECTION 02810

LANDSCAPE IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide all landscape irrigation system materials, equipment, fabrication, installation, and testing in conformity with applicable codes and authorities having jurisdiction for the following:

A. Work Included:

1. Complete automatic landscape irrigation system including trenching and backfilling for all pipes and valves, provision of mains, laterals, and risers, fittings, sprinkler heads, strainers, backflow preventers, quick couplers, valves, controllers, low voltage electric wiring, and all necessary specialties and accessories.
2. Sleeves beneath walkways, roads, and driveways where required whether shown on the Drawings or not.
3. Clearing, testing, and adjusting of the system.
4. Warranties and guarantees.

B. Related Work:

1. Earthwork.
2. Landscape Work.
3. Landscape Maintenance.
4. Electrical Work.
5. Plumbing Work.

C. Allowances: Refer to Section 01210 regarding allowance requirements, and include following Allowance amounts in the Contract Sum:

1. Allow for, in the Contract Sum, up to 10 additional shrub height pop-up irrigation heads to accommodate unforeseen conditions such as light fixtures and site furnishings installed in locations unanticipated by the Drawings.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Deliver the following submittals for review and approval:

1. Irrigation Materials.
2. Record Drawings.
3. Controller Charts.
4. Operating and Maintenance Manuals.
5. Check List.
6. Warranty and guarantee.
7. Maintenance Tools.

B. Irrigation Materials Lists: Prior to installation of any Work of this Section, prepare and submit a detailed list of each material proposed for use in Work of this Section. Prepare typewritten material list using the following format. Double space between each item.

ITEM NO.	DESCRIPTION	MANUFACTURER	MODEL NO.
1.	Pressure supply lines	Pac. Western	Schd. 40 PVC
2.	Shrub Head	Rain Bird	1804-B12
3.	Etc.	Etc.	Etc.

1. If equipment is as specified, no manufacturer descriptive catalogs are necessary in submittal.

C. Record Documents: Prepare and submit Record Documents (Record Drawings and Record Project Manual) in accordance with Sections 01330 and 01770. Maintain Field Record Set daily.

1. Record dimensioned locations and depths for each of the following:

   b. Point of Connection to existing water line(s).
   c. Point of Connection to existing electrical power.
   d. Main Line Routing (provide dimensions for each 100 lineal feet (maximum) along each routing, and for each change in direction).
   e. Gate Valves.
   f. Control Valves.
   g. Quick Coupling Valves.
   h. Control Wire Routing.
   i. Sleeves under paving.
   j. Other Related Items as directed by the Owner.

2. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs or pavements).

C. Operating and Maintenance Manuals: Prepare and submit manuals in accordance with Sections 01330 and 01770, detailing operation and maintenance requirements for the irrigation system. Include the following:

1. Index sheet, stating Irrigation Subcontractor's name, address, telephone number and name of person to contact.
2. Duration of the warranty period, with copy of each warranty.
3. Equipment list with the following for each item:
   a. Manufacturer's name.
   b. Make and model number.
   c. Name and address of local manufacturer's representative.
   d. Spare parts list in detail.
   e. Detailed operating and maintenance instructions for major equipment.

1.03 QUALITY ASSURANCE:

A. Permits and Fees: Obtain and pay for all permits and inspections for Work of this Section required by governing agencies.

B. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers used in Work of this Section furnish directions covering points not shown in the Drawings and specified.

C. Ordinances and Regulations: All local, municipal, and state laws, and rules and regulations governing or relating to any portion of Work of this Section are hereby incorporated into and made part of this Section , and their provisions shall be carried out by the Contractor. Anything contained in this Section shall not be construed to conflict with any of these rules and regulations or requirements of the same. However, when the Project Manual and Drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by these rules and regulations, the provisions of the Project Manual and Drawings shall take precedence.

D. Irrigation Superintendent: A superintendent satisfactory to the Owner and Architect shall be present on the site at all times during the progress of the Work of this Section. The Superintendent shall not be changed except with the consent of the Owner. The Superintendent shall be authorized to represent the Irrigation Subcontractor.

E. Explanation of Drawings:

1. Due to the scale of Drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. Carefully investigate the structural and finished conditions affecting all of this Work and plan Work of this Section accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The Work of this Section shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.

2. Irrigation Work called for on the Drawings by notes or details shall be furnished and installed whether or not specifically mentioned in this Section.

F. Discrepancies: Do not willfully install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage or area dimensions exist that might not have been considered in the engineering. Such obstructions or differences shall be brought to the attention of the

Architect. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

G. Work of this Section which is allied with Work of other trades shall be coordinated as necessary.

H. Underwriters' Laboratories Inc.: Electrical wiring, controls, motors, and devices shall be UL listed, and so labeled.

I. Installer Qualifications (for solvent and rubber gasket joints): Each person shall be trained by the manufacturer's representative in techniques for making correct joints prior to performing Work of this Section on the site.

1.04 CONTROLLER CHARTS: Do not prepare charts until Record Documents have been approved by the Architect. Provide one controller chart for each automatic controller installed. Chart may be a reproduction of the Record Drawing, if the scale permits fitting the controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility. Chart shall be from a print of the actual system as installed, showing the area covered by that controller. Identify the area of coverage of each remote control valve, using a distinctly different pastel color, drawn over the entire area of coverage. Following approval by the Architect, the charts shall be hermetically sealed between two layers of 20 mil thick plastic sheet. Charts must be completed and approved prior to final review of the installed irrigation system.

1.05 CHECKLIST: Furnish a signed and dated checklist and deliver to the Architect prior to final review of the installed Work of this Section. Use the following format:

A. Plumbing permits: if none required, so note.
B. Material approvals: approved by and date.
C. Pressure line tests: by whom and date.
D. Record drawings: received by and date.
E. Controller charts: received by and date.
F. Materials furnished: received by and date.
G. Operation and maintenance manuals: received by and date.
H. System and equipment operation instructions received by and date.
I. Manufacturer's warranties if required: received by and date.
J. Written warranty/guarantee: received by and date.

1.06 SITE OBSERVATION SCHEDULE: Before any Work of this Section commences, a conference shall be held with the Owner, Architect, Contractor, and Irrigation Subcontractor regarding requirements for Work of this Section. Give a minimum 7 day notice to the Owner and Architect requesting the conference.

A. Observation Meetings: The Contractor shall notify the Owner and Architect in advance for the following observation meetings (give minimum 48 hour notice to the Owner and Architect requesting meeting unless otherwise noted):

1. Backflow assembly installation.
2. Pressure supply line installation and testing.
3. Automatic controller location and installation.
4. Control wire installation.
5. Lateral line and sprinkler head layout.
6. Coverage tests prior to planting.
7. Final inspection (minimum 7 day notice required).

B. Procedure:

1. Furnish walkie-talkie equipment and/or adequate personnel at each observation meeting to maintain communication from review area to controller.
2. Provide up-to-date Record Drawings at each review. No site observations will commence without Record Drawings. If the Contractor calls for a site visit without Record Drawings or without preparing the system for said visit, the Contractor shall reimbursing the Architect at the Architect's current billing rates per hour, portal to portal, for inconvenience.
3. When observations have been conducted by other than the Architect and Owner, show evidence in writing of when and by whom these observations were made.

1.07 PRODUCT HANDLING: Store materials at a location as directed by the Contractor. Store materials in an orderly manner. Avoid interference with other construction activities. Protect all materials to prevent intrusion of

dirt and moisture. Do not store PVC material in direct sunlight. Protect the installed Work and materials of other trades.

1.08 WARRANTY: Conform to Section 01790. Warrant the irrigation system to perform service as designed and installed for a period of one year. Final acceptance of the irrigation system is defined to be the same date as final acceptance of the landscape work as specified in Section 02900. Correct all problems which develop in the system due to faulty materials or workmanship during the warranty period as approved by the Owner.

A. Make repairs and replacements promptly when notified.
B. The Owner reserves the right to make temporary repairs during the warranty period as necessary to keep irrigation systems in operating condition without voiding the Contractor's warranty, nor relieving the Contractor of its responsibilities under the warranty. All repairs and replacements shall match the original installation in every way. Furnish a written warranty for each segment of the irrigation systems, in the format shown in Section 01790.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Use only new materials of the brands and types noted on the Drawings, specified herein, or otherwise approved.

B. Proposed Substitutions: Refer to Section 01630 for requirements.

2.02 PIPE AND FITTINGS SCHEDULE:

A. Pressure supply line from point of connection through backflow preventer: ANSI schedule 40 red brass screwed pipe and 125 pound class fittings.
B. Pressure Main Line Piping and Fittings -- size 2 inches and smaller downstream of backflow preventer, Schedule 40 PVC.
C. Non-pressure lateral line (buried) -- Schedule 40 PVC.

2.03 PLASTIC PIPE:

A. Identification Markings: Identify all pipe with the following indelible markings:

1. Manufacturer's name
2. Nominal pipe size
3. Schedule or class
4. Pressure rating p.s.i.
5. NSF seal of approval
6. Date of extrusion

B. Pipe (solvent weld type) manufacture from virgin poly-vinyl chloride in accordance with ASTM D1784 or ASTM D2241, cell classification 12454B; hydrostatic design stress rating not less than 2000 p.s.i.

C. Fittings: Standard weight, Schedule 40 injection molded PVC. Comply with ASTM D1784, cell classification 13454B.

1. Threads (where required): Injection molded type.
2. Tees and Ells: side gated.

D. Threaded Nipples: Standard weight, Schedule 80 with molded threads.

2.04 JOINT CEMENT AND PRIMER:

A. Non-pressure plastic pipe and fittings (lateral lines) shall be cemented using a 100% active solvent, blue in color.
B. Pressure plastic pipe and fittings (main line) shall be coated with a primer and then with a 100% active solvent.
C. Both primer and solvent shall be similar in all respects to that manufactured by Christy's, or approved equal.

2.05 COPPER PIPE: Copper pipe and fittings shall be as specified in the Electrical Sections.

2.06 ELECTRICAL WIRING AND SERVICE:

A. High Voltage: All high voltage electrical service required for automatic controller and other equipment noted on Drawing for irrigation shall be provided by the Contractor.

B. Low Voltage:

1. Connections between controller and remote control valves shall be made with direct burial AWG-UF, 600 volt wire, insulation thickness 3/64 inch, utilizing low density, high molecular weight polyethylene insulation.
2. Splices, where permitted, shall be waterproofed using Rain Bird, Pen-Tite Connectors or fusible heat shrink tubing, and housed in a plastic box.
3. Wire sizing shall be according to manufacturer's recommendations, in no case less than No. 14.
4. Ground (common) wire shall be white in color, all others a different color.

2.07 AUTOMATIC CONTROLLER ASSEMBLIES:

A. Type: Automatic controller assemblies factory pre-assembled in a weatherproof housing. Assemblies shall be as specified on the Drawings.

B. Features:

1. Wall mount type controller in a housing with locking hinged cover. Fully automatic operation, capable of operating the number of stations indicated on Drawings, with rain guard.
2. The controller shall be mounted within a stainless steel, vandal resistant enclosure with a stainless steel predrilled removable backboard, controller, terminal strip and 117 volt outlet. The 117 volt duplex box shall be provided with an on/off switch and 117 volt receptacle. Metal conduit shall run from the 117 volt supply to the controller housing. All power within the housing shall be properly phased. A prewired terminal strip shall be provided clearly indicating the proper points of connection of all appropriate wiring.
3. Provide with surge protection features integral with controller unit designed to protect the components against electrical surges on the 120V power wiring.
4. Fuse and chassis ground all controller components.
5. The controller assembly shall be provided with a terminal strip clearly marking the positions for one rain check device and four moisture sensing devices. The terminal strip shall be wired through five clearly marked on/off switches mounted on the face of the controller to provide sensing bypass capability.
6. Provide heavy duty exterior grade padlock and (4) keys for each stainless steel cabinet.

2.08 BACKFLOW PREVENTER UNIT: Backflow preventer designed to operate on the reduced pressure principle; equipped with gate valves and field test cocks.

2.09 GATE VALVES: 2-1/2 inches and smaller, ASTM B62 brass body, 150 pound saturated steam rated; with screwed joints, non-rising stem, screwed bonnet, solid disc. Provide with handwheel.

2.10 QUICK COUPLING VALVES:

A. Two piece type brass body, 150 pound class, with 3/4 inch female threads opening at base, permitting operation with a special connecting device (coupler).

1. Coupler Threads: Lug type.
2. Hinge Cover: Provide with rubber-like vinyl cover.

2.11 REMOTE CONTROL VALVES:

A. Valve Type: Spring-loaded, packless diaphragm activated, normally closed type with brass body, equipped with flow control.

B. Valve Solenoid: 24 volt AC, 4.5 watt maximum, 500 milliamp maximum surge, corrosion-proof, stainless steel construction, epoxy encapsulated to form a single unit.

C. Provide bleeder valve to permit manual operation without controller power.

D. Provide Schrader valve capable of pressure regulation between pressures of 15 to 200 p.s.i.

2.12 SHRUB SPRAY HEADS:

A. Heads shall be similar in all respects to type noted in legend on the Drawings.
B. Body shall be plastic with 1/2 inch ips side and bottom inlets.
C. Nozzle shall be brass, adjustable, with degree of arc as noted on Drawings.
D. Nozzles on shrub heads shall rise either 6 or 12 inches, as noted on Drawings.
E. Where noted on Drawings, body shall be equipped with built-in check valve.
F. Provide plastic pressure compensating screens in bottom of heads for radius adjustment as noted in the legend on Drawings.

2.13 VALVE BOXES: Provide type and size for all valves as noted on the Drawings. Boxes shall be fabricated from a durable plastic resistant to weather, sunlight, and chemical action of soils.

A. Gate Valve Boxes: Round boxes with locking covers. Boxes shall be plastic with flex lock covers, Carson or approved substitution.

B. Remote Control Valve Boxes: Rectangular boxes with locking covers. Boxes shall be plastic with flex lock covers, Carson or approved substitution.

2.14 OPERATING AND MAINTENANCE TOOLS: Conform to Section 01770. Deliver the following items to the Owner when Work of this Section is completed and prior to final acceptance of the Work:

A. Six wrenches for disassembly and adjustment of each type of sprinkler head.
B. Two keys for each automatic controller.
C. Four couplers and matching hose swivels with globe valves.
D. Six keys for opening valve boxes.
E. Three 36 inch soil probes, Oakfield Model B or approved substitution.
F. One 48 inch steel tee wrench for gate valves with square nut.

PART 3 - EXECUTION

3.01 SITE REVIEW:

A. Site: Examine site for conditions that will adversely affect execution, permanence, and quality of Work of this Section.

1. Verify that grading has been completed and the work of this section can properly proceed.
2. Exercise extreme care in excavating and working near existing structures, utilities, underground piping and conduits, and over waterproofing membrane. Contractor is responsible for damages that are caused by his operations or neglect. Check existing utility drawings for locations.
3. Determine locations of points of connections to all piping installed by others, and determine that pressure supply is available for work of this Section.

B. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this Section.

C. Notify the Architect in writing, describing unacceptable conditions. Do not proceed with Work of this Section until unacceptable site conditions are corrected or existing utilities are located.

3.02 POINT OF CONNECTION: Contractor shall connect to water supply points of connection at locations shown on the Drawing and make any minor changes in location necessary due to actual site conditions as a part of work of this Section.

3.03 LAYOUT:

A. All piping or equipment shown diagrammatically on the Drawing outside of planting areas shall be installed inside planting areas whenever possible.
B. Lay out each sprinkler head and make any minor adjustments required due to differences between actual site conditions and the Drawings. Minor adjustments shall be maintained within the original design intent.
C. Lay out each system using staking method as approved by the Architect. Maintain and protect approved staking layout.

3.04 TRENCHING: Excavate trenches to required depths. Follow approved layout for each system. Trench bottom shall be flat to ensure piping is supported continuously on an even grade. Where lines occur under paved areas, consider dimension to be below the subgrade.

A. Provide minimum coverage as follows:

1. Main Lines larger than 2-1/2 inches: 24 inches.
2. Main Lines 2-1/2 inch and smaller: 18 inches.
3. Lateral Lines: 12 inches.
4. Control Wires: 18 inches.

3.05 LINE CLEARANCES: Provide not less than 4 inches clearance (horizontal and vertical) between each line and not less than 6 inches clearance between lines of other trades, unless otherwise noted. Do not install parallel lines directly over any other line.

3.06 BACKFILLING: Buried pipe in trenches shall be center loaded only until all required tests are performed.

A. Trenches shall be carefully backfilled with excavated materials approved for backfilling; consisting of earth, loam, sandy clay, sand or other approved materials, free from large clods or stones.

B. Initial Backfill: Clean, approved fine granular material. No foreign matter larger than 1/2 inch will be permitted in the initial backfill. In lightweight soil mix filled planters, backfill shall be lightweight soil mix only.

C. Compact trench backfill to a dry density equal to adjacent undisturbed soil. Restore to adjacent grade, free of dips, depressions, humps or other irregularities.

1. Where acceptable soils exist, the Architect may authorize flooding in lieu of tamping.
2. Compaction by truck or other vehicle is not permitted.

3.07 EXISTING PAVEMENTS: Piping under existing pavements may be installed by jacking, boring, or by hydraulic driving, except as otherwise specified or directed.

A. Secure Architect's permission prior to cutting or breaking existing pavements.
B. Make completely clean cuts using power saws, at approved locations only.
C. Replace and restore all surfaces to original condition, including grade and landscaping. Restoration work shall match the original work in every respect, including type, strength, texture, and finish.

3.08 NEW PAVED AREAS: Coordinate installation of piping and wires under paved areas with related trades.

A. If the only piping installed is over 20 feet long, pressure testing is required for that section at the time of installation. Upon completion of piping installation, the entire system must be tested.
C. If wires under paved areas cannot be continuous, all splices must be enclosed in an approved box.

3.09 INSTALLATION:

A. All plastic pipe and fittings shall be installed in complete accord with manufacturer instructions.

B. Routing of main lines as indicated on the Drawings is diagrammatic. Install lines and assemblies to conform to details on the Drawings.

C. Installation of Piping:

1. Provide concrete thrust blocks at each change in direction and at all terminal points for all rubber gasket piping and/or all piping larger than 3 inches. Block in accordance with pipe manufacturer's instructions.
2. Plastic Pipe with Threaded Fittings -- Assemble using Teflon tape applied to male threads only.
3. PVC pipe and fitting shall be thoroughly cleaned of dirt, dust and moisture prior to installation. Installation and solvent welding methods shall be as recommended by pipe and fitting manufacturer.
4. Tape all open ends of pipe to prevent entry of any foreign matter into the system.
5. On PVC to metal connections, work the metal connections first. Use teflon tape on all threaded PVC to metal joints.

D. Assemblies: Install all specified assemblies in accordance with the Drawings. In absence of detail drawings or specifications pertaining to specific items required to complete the work, perform such work in accordance with best standard practice, as approved by the Architect.

E. All major equipment shall be verified for exact location with the Architect before installation.

1. Quick Coupling Valves: Unless otherwise indicated, locate valves within 12 inches of a walkway.

2. Remote Control Valves: Locate valves in shrub areas wherever possible. Unless otherwise approved, locate valves within 2 feet of a walkway.

3. Install backflow assemblies in shrub or planter areas at minimum height permitted by local code.

4. Automatic Controllers: Verify exact location with the Architect.

F. Sprinkler Heads: All sprinklers shall be installed flush with finish grade unless otherwise noted. Spacing of heads shall not exceed the maximum shown on the Drawings.

G. Automatic Controller: Install as per manufacturers instructions. Remote control valves shall be connected to the controller in the sequence as shown on the Drawings.

3.10 VALVE BOXES: Provide at all locations indicated.

A. Fill area under box with minimum of 2 cubic feet of pea gravel before box is installed.
B. Identification:
   1. Attach identification tag showing valve number on each solenoid pigtail.
   2. Tags shall be manufactured of polyurethane Behr Desopaid, yellow in color, with black letters, 2-3/4 by 2-1/4 inches square.
   3. Tags shall be as manufactured by Christy's or equal.

3.11 LOW VOLTAGE WIRING:

A. Place wiring in the same trench and along the same routing as the main lines unless otherwise approved.
   1. Install wiring prior to main line whenever possible.
   2. When more than one wire is placed in a trench, tape wires together at maximum intervals of 12 feet.
B. Provide a 12 inch expansion loop at each connection and at each change in direction.
C. Use a continuous wire between controller and remote control valves.
   1. Except as otherwise approved, do not splice wire at any point.
   2. All approved splices shall be enclosed in an acceptable box.
D. Each controller shall be provided with separate ground (common) wire.

3.12 SYSTEM FLUSHING: After all sprinkler pipes and risers are in place and connected, and prior to installation of sprinkler heads, thoroughly flush all lines with a full head of water. Do not install sprinkler heads until lines have been flushed to the satisfaction of the Architect.

3.13 SYSTEM ADJUSTMENT:

A. Valves: Adjust flow control for proper operation.

B. Heads: Adjust for alignment and coverage for optimum performance and to prevent as much as possible any overspray onto walks and roadways. No spray is permitted on buildings.

1. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, make such changes prior to any planting. Adjustments may include changes in nozzles sizes, trajectory of spray or degrees of arc, as required.
2. All sprinkler heads shall be set perpendicular to finish grades unless otherwise indicated on Drawings and at height and distance from walks, buildings, etc. as noted.

3.14 PRESSURE TESTS: Furnish all equipment necessary to test systems, including force pump.

A. Perform all hydrostatic tests in presence of the Architect or Inspector.
B. Test all main lines under hydrostatic pressure of 150 psi for a period of 2 hours, unless otherwise required and approved. Pressure drop over test period shall be zero psi.
C. Do not backfill over any line more than is necessary for testing, until it has been inspected, tested and approved.
D. Do not install remote control valves, quick couplers, or any other valve assembly until testing is completed and approved.

3.15 COVERAGE TESTS: Perform coverage tests after sprinkler system is completed, but prior to any planting, in the presence of the Architect. Test system to assure that all planting areas are watered completely and uniformly. Make all necessary adjustments, including realignment and relocation of heads, to provide required coverage as directed by the Architect.

3.16 OPERATING INSTRUCTIONS: Train the Owner's maintenance personnel in proper operation of all major equipment. Arrange for training by manufacturer's representatives for controllers. Furnish this training at the Owner's convenience. Submit written evidence that training has been successfully completed.

3.17 CLEANUP: Conform to Section 01740. Upon completion of the Work of this Section, restore ground to required elevations and remove excess materials, debris, and equipment from the site to the satisfaction of the Owner.

END OF SECTION

SECTION 02820

CHAIN LINK FENCING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide chain link fence materials, including vinyl covered chain link fabric, framework, gates, and fittings, and windscreen/privacy fabric.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit manufacturer's technical data and installation instructions for metal fencing, fabric, gates, and accessories.

B. Shop Drawings: Submit as specified herein.

C. Samples: Submit samples of vinyl coated chain link fence fabric and all framing members, and black windscreen fabric.

1.02 QUALITY ASSURANCE: Provide chain link and gates as complete units controlled by a single source including necessary erection accessories, fittings, and fastenings.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL:

A. Dimensions shown for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings.

B. In general posts and rails shall be roll formed, open seam, self-draining shapes, hot dipped galvanized or galvanized standard weight pipe complying with ASTM F1083 or equal strength material complying with ASTM F669. All fittings shall be pressed steel or malleable iron and shall be hot dipped galvanized conforming to ASTM A123. All metal shall have the approved black vinyl coating.

2.02 FABRIC: Chain link fabric shall be aluminum coated type conforming to ASTM A491. Fabric shall be woven from 9 gauge (coated size) wire in 2 inch mesh. Fabric 72 inches and over shall be knuckled at both selvages. Chain link fabric shall be black vinyl coated.

2.03 FRAMING AND ACCESSORIES: All posts, rails, and metal fittings shall be black vinyl coated to match. the fence fabric.

A. Line Posts: Standard weight galvanized pipe, sizes and spacing as noted on the Drawings.

B. Terminal, Corner, and Pull Posts: Standard weight galvanized steel pipe, sizes as noted on Drawings, minimum bending strength of 486 pounds on 6-foot cantilevered load or 2-7/8" OD galvanized standard weight pipe with minimum bending strength of 381 pounds on 6-foot cantilevered loads

C. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate, as follows:

Up to 6'	2-7/8" O.D. pipe	4.85 pounds per foot
Over 6' to 13'	4" OD pipe	5.7 pounds per foot
Over 13' to 18'	6-5/8" OD pipe	9.11 pounds per foot

D. Top, Corner, Middle, and Bottom Rails: Standard weight galvanized pipe in manufacturer's longest lengths, with expansion type couplings, approximately 6" long, for each joint. Couplings shall be spaced at maximum 21' centers. Sizes as noted in schedule on Drawings. Provide means for attaching top rail securely to each gate corner, pull, and end post.

E. Wire Ties: 11 gage galvanized steel, to match fabric core material, spaced at 24" maximum centers.

F. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 3/8" diameter rod and adjustable tightener.

G. Post Tops: Provide weather-tight closure cap with loop to receive tension wire or top rail; one cap for each post.

H. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into the post.

I. Stretcher Bar Bands: Space not over 15" on center, to secure stretcher bars to end, corner, pull, and gate posts.

2.04 GATES: Submit Shop Drawings for all gates.

A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match the fence framework. Assemble gate frames by welding or with special fittings and rivets, for rigid connections, providing security against removal or breakage of connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members a maximum of 8' apart unless otherwise indicated. Provide same vinyl coated fabric and windscreen as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" on center.

B. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

C. Gate frames shall be tubular shaped, minimum 1.90" outside diameter with welded or steel fitted corners.

D. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A123, and in accordance with the following:

1. Hinges, size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6' nominal height.

2. Latches shall be forked type for single gates and plunger bar type for double gates. Both shall have a padlock eye and permit operation from either side of the gate. Keepers shall be provided for each gate leaf over 5' wide and shall consist of a mechanical device for securing the free end of the gate when in full open position.

2.05 WINDSCREEN: 100% polyester thread fabric, 92%-94% closed mesh, minimum 7 oz. per square yard, and with fabric tape reinforced hemmed edges and attachment grommets at 24" o.c. maximum spacing. Color black.

PART 3 - EXECUTION

3.01 INSTALLATION: Do not begin installation and erection before final grading is completed, unless otherwise permitted.

A. Excavation: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacing indicated in firm undistributed or compacted soil. Excavate holes for each post to minimum diameters as recommended by fence manufacturer, and as indicated on the Drawings, but not less than 4 times largest cross section of post.

B. Setting Posts: Center and align posts in holes minimum 3" above bottom of excavation. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Concrete footings shall be toweled to a crown to shed water and shall be placed in relationship to finish grade as follows:

1. Tops of footings where mowstrip is indicated or specified: 6" below finish surface of mowstrip.
2. All other locations: 2" above finish grade.

C. Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fence manufacturer.

D. Center Rails: Provide where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

E. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

F. Fabric: Leave approximately 2" between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

G. Stretcher Bars: Thread through or clamp to fabric 4" on center, and secure to posts with metal bands spaced 15" on center.

H. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

I. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing. Tie fabric to line posts, with wire ties spaced 12" on center. Tie fabric to rails and braces, with wire ties spaced 24" on center. Tie fabric to tension wires, with hog rings spaced 24" apart.

J. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

K. Attach wind screen using black plastic cable ties as approved by fabric manufacturer.

3.02 COMPLETION: Remove excess earth spoil and excess materials from the site.

END OF SECTION

SECTION 02825

ORNAMENTAL METAL FENCING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. This Section includes ornamental metal fencing as indicated and specified, complete.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit for each product used in the ornamental metal fencing, including finishing materials and methods. Include Product Data for grout and anchoring cement.

B Shop Drawings: Show fabrication and installation of ornamental metal fencing. Include plans, elevations, component details, and attachments to other Work. Indicate materials and profiles of each ornamental metal fencing member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

C. Calculations: With Shop Drawings, submit structural calculations for the fencing prepared and stamped by a California registered structural or civil engineer. Fencing shall withstanding a uniform load of 50 pounds per linear foot applied simultaneously in both the vertical and horizontal directions when tested in accordance with ASTM E935, unless greater loads are required by the governing code.

D Samples: Submit Samples of fencing materials and finish as requested by Architect. Submit a full range of powder coat finish colors corresponding to Architect's color instructions.

1.03 QUALITY ASSURANCE: Fabricate custom ornamental metal fence items in the shop of an experienced ornamental metal designer and fabricator having successful performance record of at least 5 years.

PART 2 - PRODUCTS

2.01 METAL FENCING: Fabricate of 2" square welded steel tube framing with 1" square steel tube pickets. Grind all exposed welds smooth and flush. Hot-dip galvanized after fabrication, and then apply specified powder coat finish.

2.02 POWDER-COAT FINISH:

A. Finish: Shall be applied by a finisher fully equipped to prepare and clean metal surfaces, electrostatically apply powder coating, and bake coated item in a thermostatically controlled oven at the correct temperature recommended by the manufacturer of the polymer material, usually about 30 minutes at 400°F.

B. Polymer Type: Only use polyester polymer powder-coating material; do not use epoxy type powders.

C. Preparation: Metal surfaces shall be free of deleterious substances including, without limitation, grease, oil, dirt, markings, preservatives, paint, varnish, wax, rust, and all other adverse materials. Metals shall be cleaned until clean bare galvanized metal surfaces are produced.

D. Metal Conditioning: After cleaning, metal shall be given a chemical wash and rinse, followed by an iron phosphate treatment.

E. Powder Coating: Electrostically apply the powder material at high voltage. Produce a uniform thickness of coating on all surfaces including into corners, angles, and on returned edges. Handle coated products carefully so the coating is not disturbed or damaged. Promptly place the coated item in the oven and uniformly melt and fuse the polyester coating to metal. Finished and cooled coating shall be not less the 2 mils thick when measured with an electronic thickness gage.

PART 3 - EXECUTION

3.01 INSPECTION: Refer to Section 01710, Article "Verification of Conditions", and report to Architect in writing those conditions that prevent or interfere with correct installation of Work of this Section.

3.02 INSTALLATION: Anchor fencing posts in place with non-shrink grout finished flush with adjoining surface. Do not install material with damaged powder coat finish; refinish such items at no extra cost to Owner.

3.03 INSTALLATION: Conform to approved submittals and each manufacturer's or fabricators instructions. Install in straight lines or curves as indicated with top caps and rails level or sloped as required. Remove all damaged or defaced material and replace with new conforming material.

3.04 CLEANING AND FINISHING: Conform to Section 01740. After installation is completed, clean and polish exposed metal surfaces with non-abrasive cleaner and soft cloths. Clean powder coat finish as recommended by coating manufacturer. On all exposed metal surfaces, apply two coats of silicone or teflon base auto paste wax and buff each coat to high polish.

END OF SECTION

SECTION 02845

PARKING BUMPERS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide parking bumpers in pavement areas, complete.

PART 2 - PRODUCTS

2.01 PARKING BUMPERS: Standard product units cast of minimum 3500 psi concrete and reinforced full length to within 3" of ends with not less than two deformed No. 4 reinforcing bars, units about 7-1/2" wide and 5-1/2" high with the upper portion of sides beveled and stake holes located 8" to 11" from ends. Omit the stake holes in adhesive secured bumpers.

PART 3 - EXECUTION

3.01 INSTALLATION OF BUMPERS: Set bumpers with two 3/4" diameter galvanized steel pipes, or equal, driven to minimum 12" penetration into subgrade. Fully embed each bumper in epoxy concrete adhesive where installed on portland cement concrete.

END OF SECTION

SECTION 02900

LANDSCAPE WORK

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Perform work and provide materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of Landscape Planting, complete, as shown on the Drawings and/or as specified herein.

A. Work Included:

1. Soil preparation for on-grade planting including rock removal.
2. Lightweight soil mix and drainage materials for roof-deck planters.
3. Finish grading.
4. Plant materials including trees, shrubs, sod, and flatted ground covers.
5. Staking and guying of trees.
6. Protection and guarantees.
7. Miscellaneous work for completion.

B. Related Work:

1. Earthwork.
2. Landscape Irrigation System.
3. Landscape Maintenance

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Submit the following for review and approval:

A. Data: Submit source, manufacturer's data sheets, and Samples where specified, at a minimum, for each of the following:

1. Organic amendment.
2. Lightweight soil mix
3. Agricultural pumice.
4. Filter fabric.
5. Fertilizers.
6 Soil conditioners.
7. Mulch including sample.
8. Plant materials (see Section 2.07).
9. Tree ties.
10. Landscape topsoil (if needed due to means and methods).

B. Certificates: In addition to other certificates specified, the Contractor shall furnish a certificate with each delivery of bulk material, including topsoil if required, stating the source, quantity and type of material; and shall verify that the material conforms to the requirements specified. A similar certificate shall be submitted for each delivery of material in containers, including soil conditioners and fertilizers, prior to the start of the installation.

C. Test Reports: Submit soils test results and soils test location plan as described in Pert 3 herein.

1.03 QUALITY ASSURANCE:

A. Applicable Standards:

1. American Association of Nurserymen Grades and standards.
2. American Joint Committee on Horticultural Nomenclature: 1942, edition of Standardized Plant Names.

B. Coordination: The Work of this Section shall be coordinated with all underground utilities and trades responsible for their installation and with all related Work in other Sections.

C. Permits: Obtain and pay for all permits and inspections required by governing agencies.

D. Ordinances and Regulations: Local, municipal, and state laws, and rules and regulations governing or relating to any portion of this Work are hereby incorporated into and made part of this Section provisions shall be carried out by the Contractor. Anything contained herein shall not be construed to conflict with any of these rules

and regulations or requirements of the same. However, when the Contract Documents call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by these rules and regulations, the provisions of the Contract Documents shall take precedence.

E. Protection: Erect and maintain barricades, warning signs and lights, and provide guards as necessary or required to protect all persons on the site.

F. Quality: All Work of this Section shall be performed with professional quality and to the satisfaction of the Owner and Architect; all materials shall be new and of the brand and quality specified and/or noted on the Drawings; and all workmanship shall be of the best, and not simply ordinary, quality and shall be performed by skilled workmen.

G. Landscape Superintendent: A landscape superintendent satisfactory to the Owner and Architect shall be present on the site at all times during progress of the Work of this Section.

1. The Landscape Superintendent shall not be changed, except with consent of the Owner.
2. The Landscape Superintendent shall be authorized to represent the Landscape Subcontractor.

H. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers used in Work of this Section furnish directions covering points not shown in the Drawings or specified.

I. Landscape Work called for on the Drawings by notes or details shall be furnished and installed whether or not specifically mentioned in this Section.

J. Deviations: The Contractor shall in no case deviate from the arrangements showing types, locations, sizes and quantities of materials as set out in the Drawings and/or specified, unless the Drawings and/or requirements specified are previously modified by the Owner.

K. Discrepancies: The Contractor shall not willfully install the landscaping as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage or area dimensions exist that might not have been considered in the design. Such obstructions or differences shall be brought to the attention of the Architect. If this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

1.04 SITE OBSERVATION SCHEDULE: Before any Work of this Section commences, a conference shall be held with the Owner, Architect, and Contractor regarding general requirements of Work of this Section. Give a minimum 7 day notice requesting the conference.

A. Meetings: The Contractor shall notify the Owner and Architect in advance for the following observation meetings (give minimum 48 hour notice unless otherwise specified):

1. At the completion of finish grading.
2. When trees and shrubs are spaced for planting, but before holes are excavated. The Owner reserves the right to relocate trees and shrubs from positions shown on the Drawings prior to planting at no extra cost to the Owner.
3. At the start of maintenance period.
4. At the end of maintenance period.

1.05 MAINTENANCE PERIOD:

A. Upon completion of the construction and written approval of the project as evidenced by the Pre-maintenance Inspection approval, the contractor shall be responsible for maintaining the project for a period of ninety (90) days.

1. Refer to Landscape Maintenance Section for requirements.

B. Final Acceptance: Acceptance for all landscape work shall be given after final inspection by the Owner=s Representative, provided the job is in a completed, properly maintained, and undamaged condition.

1.06 PROJECT CONDITIONS: All lines and levels necessary for the location and installation of the landscape construction and for all excavation, filling, and grading work shall be established by the Contractor. The Contractor shall take measurements of the site, verify the same with the Drawings, and shall be responsible for the proper fit of this portion of the completed Work. Extra charges or compensation will not be allowed due to differences between actual measurements and the dimensions shown on the Drawings, but any such differences which may be found shall be submitted to the Architect for adjustment before proceeding with the landscaping.

A. Water: Will be available on the site at no expense to the Landscape Subcontractor. Hose and other watering equipment required for the Work of this Section shall be furnished by the Landscape Subcontractor at its expense.

B. Protection: Provide and maintain substantial and adequate protection as may be required to protect new and existing work and all items of equipment and furnishings for the entire duration of the Work of this Section. The Contractor shall repair or make good any and all damage or loss caused to the building or other property of the Owner at no cost to the Owner and to the full satisfaction of the Owner.

C. Repairs: All portions of the Work that may be broken or injured by accident or in the course of or on account of construction operations, or by reason of any other cause whatsoever during the progress of the Work, shall be carefully and neatly repaired or reconstructed and the whole left in first class condition and turned over to the Owner ready for use.

1.07 WARRANTY: Conform to Section 01790 and following requirements.

A. Plants 15 Gallon and Larger: Shall be warranted for a 12 month period after final acceptance. Trees smaller than 15 gallon, shrubs, and ground covers shall be warranted for 90 days after final acceptance. The Contractor shall replace all materials not in a vigorous, thriving condition, as soon as weather permits when so requested by the Owner. Plants, including trees, which have partially died so that shape, size, or symmetry has been damaged, shall be considered subject to replacement. In such cases, the opinion of the Owner shall be final.

1. Plants used for replacement shall be of the same kind and size as those originally specified. All work, including materials, labor, and equipment used in replacements, shall be at no cost to the Owner. Replacement plants shall carry the same guarantee as original. Any damage, including ruts in bed areas, incurred while making replacements shall be immediately repaired.
2. At the direction of the Owner, plants may be replaced at the start of the next year's planting or digging season; but in such cases, dead plants shall be immediately removed from the premises.
3. When plant replacements are made, plants, plant soil mix, fertilizer, mulch, etc., shall be replaced as originally specified, and re-inspected for full compliance with the Contract Document requirements. All replacements shall be included under Work of this Section.

PART 2 - PRODUCTS

2.01 APPROVAL AND REJECTION OF MATERIALS:

A. The selection of all materials and execution of all operations required under the Drawings and this Sections are subject to the approval of the Owner.

B. The Owner will reject all material and all work which, in the Owner's opinion does not meet the requirements indicated and/or specified, at any stage of the operation. All rejected materials shall be promptly removed by the Contractor as directed.

2.02 SUBSTITUTIONS OF MATERIALS: Refer to Section 01630 for basic requirements.

A. Before submitting a bid locate all necessary materials called for and assure of their availability for use on the Work. The bids shall be based upon providing the specified materials, processes, products, etc., identified in this Section and/or indicated on the Drawings. If the Contractor is unable to provide a material specified and does not so qualify its bid prior to submittal, the Owner reserves the right to locate such material from any qualified source and require its use by the Contractor regardless of cost without change to any terms of the Contract.

B. Substitutions will be permitted only upon submission of proof that specified items are not obtainable, and then only with the authorization of the Owner. The Owner reserves the right to locate any such originally specified materials. Written requests for substitution with nearest available size, variety of plant, and price adjustments shall be submitted to the Owner for approval prior to shipment of any substituted material to the site.

2.03 CONTRACTOR'S RESPONSIBILITY TO SUPPLY PLANT MATERIALS:

A. Upon award of the Contract immediately locate all trees 15 gallon and larger for use on the project, including palm tress, unless otherwise approved by the Owner. Notify the Owner and Architect in writing the location and/or nursery that is growing the trees. The Contractor shall supply all trees at the heights, spreads, and calipers specified on the Drawings. Immediately notify the Owner if the specified plant materials are unavailable.

B. Photograph all plant material 24" box size and larger intended for use in the project. Send color photos to the Owner and Architect for preliminary approval. The Owner may, but is not obligated to, inspect plant material at

the nursery prior to shipment or at the site for planting. Any plant material found to be inconsistent with supplied photographs, whether inspected at the nursery or not, or otherwise not complying with the Drawings and requirements specified in any way, shall be replaced whether installed or not at no additional cost to the Owner.

2.04 STORAGE OF MATERIALS: Secure permission from the Owner to store plants on the project site, and take care to ensure that they are protected from damage by sun, wind, rain, theft, and construction work. The Contractor shall furnish all security and protection of stored plant materials up to final acceptance.

2.05 SOIL AMENDMENTS AND CONDITIONERS:

A. Organic Amendment: Nitrolized redwood sawdust (0.5% actual nitrogen), or nitrolized-mineralized fir sawdust (0.8% nitrogen), or nitrolized fir bark (1% actual nitrogen). It shall be fine textured, having a minimum of 90% passing #4 mesh screen, and a minimum of 80% passing #8 mesh screen.

B. Fertilizer: Commercial, granulated type, 16-6-8 and ammonium sulphate 21-0-0. It shall be uniform in composition, dry and free flowing, to be delivered to the site, in unopened containers, each bearing the manufacturer's guaranteed chemical analysis and weight.

C. Gypsum: Agricultural or landscape grade testing 65-95% calcium sulfate (CaSO4).

D. Landscape Import Topsoil (topsoil for use in on-grade planted areas if import is required to meet grades shown on the grading plan where existing site soil stockpiles are inadequate): Shall be natural, friable, sandy loam (silt plus clay shall not exceed 40%, and silt shall not exceed 25%, by weight); free from sticks, stones, foreign matter, alkali, or other harmful substances. It shall have an electrical conductivity of less than 4.0 millimhos per centimeter as measured on the saturation extract. It shall have a sodium absorption ratio of less than 5 as measured on the saturation extract. Boron in the saturation extract shall be less than one part per million. A sample of imported topsoil shall be submitted to an approved soil testing laboratory for testing to assure that the topsoil meets the above requirements.

E. Soil Sulfur: Agricultural or landscape grade granular or powdered material uniform if composition, dry and free flowing, testing 95% pure elemental sulfur, to be delivered to the site, in unopened containers, each bearing the manufacturer's guaranteed chemical analysis and weight.

F. Iron Sulfate: Iron (expressed as metallic) derived from ferric and ferrous sulfate, 20%; sulfur (expressed as elemental), 10%; uniform in composition, dry and free flowing, to be delivered to the site, in unopened containers, each bearing the manufacturer's guaranteed chemical analysis and weight.

G. Organic Mulch: For use in general landscape areas, fine grade redwood pebble bark ('walk-on' bark) - Sequoia Horticultural Products, (209)591-1177, Pebble Bark 1/4" - 3/4" or approved substitution.

2.06 LIGHTWEIGHT SOIL MIX: Shall be free of weeds, seeds, insects, and all deleterious materials. Bulk mixed commercial formulations intended for this purpose shall contain not less than the specified minimum percentage of peat moss and redwood shavings or ground bark.

A. Lightweight soil mix shall consist of the following:

50% by volume washed nursery sand
40% by volume peat moss
10% by volume fine grade agricultural pumice

B. For each cubic yard of the above mix, add the following and thoroughly mix to incorporate all components:

4 oz. potassium nitrate
4 oz. potassium sulfate
2.2 lb. single superphosphate
7.2 lbs. dolomite lime
2 lb. calcium carbonate lime

2.07 PLANT MATERIALS:

A. Plant materials shall be furnished in the quantities required for completed Work as indicated on the Drawings, and shall be as specified.

B. Plant names listed on the Drawings conform to the Joint Committee on Horticultural Nomenclature, except that for names not covered therein, the established custom of the nursery trade is followed. Multi-trunk defines a

plant having three or more trunks of nearly equal diameter developed from the single crown of a root-ball; 'Make-up' multi-trunk trees will not be accepted.

C. Plants shall be nursery grown under climatic conditions similar to those at the site. Plants shall meet the standards of the American Association of Nurserymen in all ways.

D. Ornamental Trees, Palm Trees, and Shrubs:

1. Plants shall be symmetrical, typical for variety and species; sound, healthy, vigorous and free from plant disease, insects and their eggs, and shall have healthy, full root systems, filling their containers, but not root bound.
2. Plants shall not be pruned prior to delivery except as authorized by the Owner..
3. Plants shall be protected in transit and after delivery. Plants in broken containers will not be accepted. Plants with broken branches or injured trunks will not be accepted.
4. Container stock shall have been grown for at least six (6) months in the containers in which they are to be delivered, but shall not be root bound.
5. Container plants with cracked or broken balls of earth when taken from the containers may be planted only with specific approval of the Owner.

E. Ornamental Ground Covers: Shall be as designated on the Drawings and on the planting legend. Ground covers shall be sound, healthy, vigorous, free from plant disease and insects or their eggs; and, unless otherwise indicated, shall be rooted plants or cuttings grown in flats. Ground covers shall be protected in transit and after delivery.

F. Sodded Lawn:

1. Sod shall be guaranteed to be sound, healthy, vigorous, and free from weeds and weed seed, plant disease, insects or their eggs, and scars and markings.
2. All sod shall be freshly cut within 24 hours prior to the installation and fully protected from any damage or drying in transit and after delivery.
3. Sod shall be standard cut thickness unless otherwise indicated on the Drawings.
4. The variety of the sod shall be as specified on the Drawings.

2.07 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Concrete and Concrete Reinforcement for headers: See Section "Portland Cement Concrete Paving".

B. Lumber: All lumber shall be new. Wood stakes for tree staking shall be lodgepole pine pressure treated with copper napthanate, a minimum of 2" in diameter, length as required to provide adequate support for tree.

C. Hardware:

1. All hardware shall be new and galvanized commercial quality material. Miscellaneous hardware includes turnbuckles, nails, bolts, nuts, etc.
2. Guy wire shall be single No.10 gauge galvanized steel wire.
3. Eye bolts shall have eye welded close.

D. Tree Ties: Vinyl covered rigid steel loop ties nailed to tree stakes.

E. Filter Cloth: Trevira spun filter fabric or approved substitution.

F. Pumice: Agricultural grade, 2" minus gradation, for drainage course.

PART 3 - EXECUTION

3.01 PREPARATORY WORK:

A. Remove from the site and dispose of all soil that contains any deleterious substances such as oil, plaster, concrete, gasoline, paint, solvents, lime, etc., removing the soil to a minimum depth of six inches or to the level of dryness in the affected areas. The affected soil shall be replaced with topsoil as specified herein.

B. Perform as part of the Work of this Section two (2) composite soil tests and corresponding soil amendment and fertilization recommendations. Tests shall be agricultural suitability and fertility tests utilizing the University of California method, and shall be performed by a certified soil testing laboratory approved by the Owner. The Soils Laboratory must be informed of the type of landscaping proposed for each soils area. The first test shall consist of

composite soil samples from a depth of 8" - 12", and the other test shall consist of composite soil samples from a depth of 24" - 30". Notify the Owner and Architect before samples are taken, so the Owner may direct the location of sampling when necessary. Furnish a reproducible print(s) of the landscape planting plan, clearly designating and labeling the soil sample locations. Submit soil test results prior to delivery of soils amendments to the job site.

C. The Contractor shall also conduct as part of the scope of this section a minimum of ten water percolation tests as follow. Ten holes a minimum of 3' by 3' by 2' deep shall be dug at widely separate locations on the site, locations as directed by the Owner. Tree planting pits may be used for these tests. Each hole shall be filled with water and allowed to completely drain. Refill each hole and measure the rate the water level drops over a minimum of four hours. Any rate less than 1 inch drop per hour shall be immediately reported to the Owner and no further work shall be done until direction to proceed has been issued by the Architect.

3.02 SITE WORK: Apply pre-emergent herbicide to all shrub and ground cover areas.

A. Deep rip all on-grade planting areas to a depth of eight inches. Remove all stones greater than 2" diameter within the top 8 inches of all planting areas. Use balloon tire mounted equipment only in landscaped areas. Where settling of planting areas occurs due to the removal of stones, the Contractor shall add new topsoil to bring areas to finish grades. Alternatively, the Contractor may at his option remove the top 8 inches of soil from all planting areas and replace it with topsoil as herein specified. All soil and debris shall be removed from planting areas and removed from the site.

B. Install drainage course, filter fabric, and lightweight soil mix in areas indicated on the Drawings.

1. Use conveyances and provide protection as required and approved by waterproofing system installer while distributing materials over water proofed slabs.
2. Perform required leak tests and otherwise verify integrity of waterproofing of roof slabs to receive lightweight soil mix fill before proceeding with landscape work
3. Grade slope transitions around lightweight fill areas as indicated prior to placing materials.
4. Verify the installation of all waterproofing system components, including protection board, before installing drainage course.
5. Spread drainage course pumice to the depth indicated. Do not damage integrity of waterproofing.
6. Lay filter fabric following manufacturer's recommendations. Maintain a minimum overlap of 6 inches between runs. Wrap fabric a minimum of 6 inches up on adjacent vertical surfaces.
7. Spread lightweight soil mix to depths indicated. Observe all required precautions to maintain integrity of waterproofing.

C. Water settle all backfilled areas, including pipe trenches, play sand, and lightweight soil mix areas, thoroughly saturating the fill from bottom to top in a manner to drive out all air and voids. Add new lightweight soil mix as directed and as necessary to bring settled areas to finish grades. Lightweight soil mix filled areas are to be overfilled a minimum of 10% by volume to allow for future settling.

D. Finish Grading: Slope planting beds away from buildings, and direct surface drainage as indicated on the Drawings. Grade to within 1" of the top of curbs and paving. Remove all stones greater than one inch in diameter from the surface soil. Notify the Owner and Architect 48 hours in advance for approval of finish grades.

3.03 SOIL PREPARATION:

A. In all on-grade planting areas shown on the Drawings add the following amendments per 1,000 square feet to a depth of 6 inches:

1. 4 cubic yards organic amendment
2. 50 pounds gypsum
3. 2 pounds soil sulfur
4. 12 pounds 16-6-8 fertilizer

B. Backfill for plant pits shall be:

1. 6 parts by volume site soil
2. 4 parts by volume organic amendment
3. 1 pound iron sulfate per cu. yd. of mix
4. 2 pounds 16-6-8 per cu. yd. of mix

The above materials should be thoroughly blended prior to use for backfill purposes. Do not allow iron sulfate to come in contact with concrete or building surfaces since severe staining may occur. Omit soil preparation for planting areas with lightweight soil mix. Use lightweight soil mix for plant pit backfill for all planting in slab bottom planters.

C. The soil amendments in the soil preparation and backfill mixture in paragraphs 3.04.A and 3.04.B above shall be installed as specified unless otherwise recommended by the soil testing laboratory. The soil laboratory recommendations shall have precedence over the above specified requirements.

3.05 INSTALLATION OF PLANT MATERIALS:

A. Trees, Shrubs, and Rooted Ground Covers:

1. Maintenance of plant materials shall begin immediately after each plant is delivered to the site.
2. All shipments of nursery materials shall be thoroughly protected from the sun and from drying winds during transit. All plants which cannot be immediately planted upon delivery to the site shall be protected against drying by wind and sun. All plants remain the property and responsibility of the Contractor until final acceptance.
3. Plants shall not be allowed to dry out before or while being planted. Keep exposed roots moist by means of wet sawdust, peat moss or burlap at all times during planting operations; do not expose to the air or sunlight except while being placed in the ground. Wilted plants, whether in place or not, will not be accepted and shall be replaced at the Contractor's expense.
4. Position trees and shrubs or stake their intended locations as shown on the Drawings. Notify the Owner and Architect for inspection and approval 48 hours in advance of all positioning of plant materials prior to planting.
5. Excavate plant pits to the depths and widths indicated on the planting details. Tree pits shall be of such depth that, when planted and settled, the crown of the plant shall bear the same relation to finish grade that it did to soil in its container prior to planting.
6. Plants shall be set vertically and soil mix filled in to half the depth of rootball, and then tamped and thoroughly watered. The remainder of the pit shall then be filled with soil mix, tamped and thoroughly watered, all within the same day of planting. Watering means thorough saturation of all backfill in plant pits, applied only by open end hose at very low pressure.
7. All tree, shrub and ground cover areas shall be mulched pebble bark spread to a minimum settled thickness of one inch (1") over the entire area of bed then raked to an even surface. All mulch shall be applied within four (4) days after planting. After leveling, water the full depth of mulch.
8. Trees shall only be pruned after inspection and approval by the Owner. Care shall be taken to preserve the tree's natural appearance. Broken or badly bruised branches shall be removed with a clean cut, angled to permit drainage. Pruning shall only be done by skilled men in accordance with t the best horticultural practice, appropriate to the type and special requirements of the tree.
9. Stake or guy trees within 48 hours of planting. Install tree guards around base of trees in lawn areas.
10. Ground covers shall be planted so that after settling, the crown of the plant is even with the finished grade. After planting, smooth the soil around the plants and water thoroughly with a light spray until the soil is saturated and all air pockets are eliminated.

B. Sodded Lawn:

1. Pre-irrigate area to be sodded to a depth of 6" the day before planting.
2. Recheck finished grade and make final adjustments as required.
3. Roll area lightly with a 300 lb. full water roller.
4. Lay sod in a staggered pattern and in straight lines parallel to adjacent walks or street. Tightly butt each unrolled piece to the one adjoining it. No patching of partial rolls will be allowed at outer edges of sodded area.
5. Water sod after installation of each sizeable portion so that all areas are watered not more than 30 minutes after laying.
6. After laying, roll sod lightly with a 1/2 filled 300 lb. water roller to squeeze out air pockets.
7. Do not allow any foot traffic on new sod for a period of 2 weeks following installation.

3.06 BARK MULCH: Complete specified weed control treatment of area to receive bark mulch surfacing, including application of pre-emergent herbicide.

A. Install bark mulch in general groundcover areas to a minimum settled depth of one inch.

1. Rake and level mulch to an even thickness.
2. Water settle mulch to eliminate dust.
3. Do not allow excess mulch to become entangled in plant materials.

3.07 CLEANUP: Conform to Section 01740. During the Work of this Section, the premises shall be kept neat and orderly at all times. Storage areas for plant and other material shall be neat and orderly. All trash, including debris resulting from removing weeds and rock from planting areas, preparing beds, or planting plants shall be removed from the site daily as the Work progresses. All walks and drives shall be kept clean by sweeping and/or

hosing; excavated soil may be distributed on the site if permitted by the Owner. Remove all tags, labels, nursery stakes, and ties from all plants.

END OF SECTION

SECTION 02970

LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Perform continuous Landscape Maintenance, complete as specified during progress of the Work, after installation, and for a period of 90 days after Preliminary Landscape Acceptance (See Section 02900 - Landscape Work).

A. Related Work:

1. Irrigation System - Section 02810.
2. Landscape work - Section 02900.

1.02 REFERENCES:

A. University of California Cooperative Extension Publications:

1. "Fertilizing Woody Plants", Leaflet #2958, Sept. 1979.
2. "Pruning Landscape Trees", Leaflet #2574, Jan. 1979.
3. "Staking Landscape Trees", Publication #AXT-311.

B. "Arboriculture: Care of Trees, Shrubs and Vines in the Landscape" by Richard W. Harris, Prentice-Hall, Inc. 1983.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Quality Control Submittals:

1. Schedule of maintenance operations and monthly status report including list of equipment, materials proposed for the job and watering schedule.
2. Licenses, permits and insurances required by the City, the State or Federal government pertaining to maintenance work.
3. Monthly record of all herbicides, insecticides and disease control chemicals used for the project.
4. Documentation of existing planting and irrigation system.
5. Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls proposed for this work.

B. Project Close-out Submittal: Include in a single, 3-ring binder a landscape maintenance manual containing an indexed collection of all schedules, records and permits listed above, as well as a documentation of accepted condition of planting and irrigation at Final Acceptance. Conform manuals to Section 01770.

1.04 QUALITY ASSURANCE:

A. Qualifications:

1. Experience: The Landscape Subcontractor or maintenance Subcontractor shall have a full-time employee assigned to the job as foreman for the duration of the Contract, who have a minimum of four (4) years experience in landscape maintenance supervision, with experience or training in entomology, pest control, soils, fertilizers and plant identification.

2. Labor Force: The landscape maintenance labor force shall be thoroughly familiar with, and trained in, the work to be accomplished and shall perform the task in a competent, efficient manner acceptable to the Owner.

B. Requirements:

1. Supervision: The foreman shall directly supervise the work force under this Section at all times. Notify Owner of all changes in supervision.
2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force. Be uniformly dressed in a manner satisfactory to the Owner.

1.05 PROJECT/SITE CONDITIONS:

A. Site Visit: At beginning of maintenance period, visit and walk the site with the Owner and/or Architect to clarify scope of maintenance work and understand existing project/site conditions.

B. Documentation of Conditions: Document condition of existing trees, shrubs, vines, groundcovers and lawn recording all plant materials which are healthy, thriving, damaged, dead, or dying.

C. Irrigation System: Document condition of existing irrigation system, making sure that faulty electrical controllers, and broken or inoperable sprinkler heads are reported.

1.06 SEQUENCING AND SCHEDULING: Perform all maintenance during hours mutually agreed upon between Owner and Contractor. Work force shall be present at the project site at least once a week and as often as necessary to perform specified maintenance in accordance with the approved maintenance schedule.

1.07 WARRANTY: For specific requirements, refer to the following Sections:

A. Landscape Work - Section 02900.

PART 2 - PRODUCTS

2.01 MATERIALS: All materials and equipment shall be provided by the Contractor, except as specified below.

A. Water: Clean, potable and fresh, as available from owner

B. Fertilizers: Commercial, granulated type, 16-6-8, and ammonium sulfate 21-0-0. It shall be uniform in composition, dry and free flowing, to be delivered to the site, in unopened containers, each bearing the manufacturer's guaranteed chemical analysis and weight.

C. Herbicides, Insecticides, and Fungicides:

1. Best quality materials with original manufacturers' containers, properly labeled with guaranteed analysis.
2. Use non-staining materials.

2.02 EQUIPMENT:

A. General: Use only the proper tool for each job. Maintain all tools in sharp, properly-functioning condition. Clean and sterilize pruning tools prior to usage.

B. Insect/Disease Prevention: Take all measures to prevent introduction of insect or disease-laden materials onto the site.

PART 3 - EXECUTION

3.01 ESTABLISHING THE MAINTENANCE PERIOD: Provide landscape maintenance of all planted areas and materials for 90 days after acceptance of planting work, until Final Acceptance. Replace failed materials promptly.

A. Preliminary Review: As soon as planting is substantially completed per documents, hold a preliminary review to determine the condition of the work.

B. Date of Review: Notify the owner=s representative at least five (5) workings days prior to anticipated date of review.

C. Beginning of the Maintenance Period: The date on which the owner=s representative issues a letter of Preliminary Acceptance to the contractor.

3.02 PREPARATION:

A. Protection: Protect all new planting areas from damage of all kinds from beginning of work until sufficiently established or until Final Acceptance. Provide temporary protection fences, barriers, and signs as required for protection.

B. Replacements: Immediately treat or replace all plants which become damaged or injured as a result of Contractor's operations or negligence, as directed by the Owner, at no cost to Owner. Replacement plants shall match size, condition, and variety of plants replaced.

3.03 PLANTING:

A. Watering Basins:

1. Maintain all watering basins around plants so that enough water can be applied to establish moisture through major root zones.
2. For supplemental hand watering of watering basins, use a water wand to break the water force. Do not permit use of "jet" type watering equipment. Do not permit crown roots to become exposed to air through dislodging of soil and mulch.
3. Maintain originally called for depth of mulch to reduce evaporation and frequency of watering.
4. In rainy season, open basins to allow surface drainage away from the root crown where excess water may accumulate. Restore watering basins at end of rainy season.

B. Resetting: Reset plants to proper grades and upright position.

C. Weed Control:

1. All areas between plants, including watering basins, shall be weed free at all times.
2. Use only recommended and legally approved herbicides to control weed growth.
3. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.

D. Pruning:

1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which have vertical spacing of 18 in. to 48 in. and radial orientation so as not to overlay one another.
2. Prune trees to eliminate diseased or damaged growth, and narrow V-shaped branch forks that lack strength. Reduce toppling and wind damage by thinning out crowns.
3. Prune trees to maintain growth within space limitations, maintaining natural appearance and balancing crown with roots.
4. No stripping of lower branches ("raising up") of young trees will be permitted.
5. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth (tapered trunk). Do not cut back to fewer than six buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.

6. Thin out and shape evergreen trees when necessary to prevent wind and storm damage. Do primary pruning of deciduous trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.
7. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
8. Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch.
   a. Make larger cuts (1 in. in diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.
9. Branches too heavy to handle shall be precut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18 in. or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.
10. Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.
11. Clip shrubs to be hedged when branches project 2 in. beyond limit of clipped hedge shown on the Drawings.
12. Take extreme care to avoid transmitting disease from one infected plant to another. Properly sterilize pruning tools before going from one infected plant to all other plants.

E. Staking and Guying of Trees: Inspect stakes and guys at least once a month to check for rubbing that causes bark wounds. Conform to the recommended procedures of staking and guying as outlined in the University of California Publication AXT-311, "Staking Landscape Trees.

3.04 GROUNDCOVERS:

A. Watering: Check for moisture penetration throughout the root zone at least twice a month. Water as frequently as necessary to maintain healthy growth of groundcovers.

B. Weed Control: Control weeds, preferably with pre-emergent herbicides and with selective systemic will be the principle form of weed control. Minimize hoeing of weeds in order to avoid plant damage.

C. Fertilization:

1. Recently installed plant materials: Verify with owner actual completion date of planting installation and rate of prior application of fertilizers.
2. Fertilize all shrub and ground cover beds with 16-6-8 fertilizer at the rate of 1 pound of actual nitrogen (6.25 pounds) per 1,000 square feet in the first week of each month commencing 30 days after the start of the maintenance period unless otherwise directed by the soils testing laboratory.
   a. apply fertilizer after the morning dew has dried but before the peak heat of the afternoon.
3. Water all shrub and ground cover stations for a single cycle following application of fertilizer.

D. Replace dead and missing plants after obtaining owner's agreement to pay for replacement. Damages due to Contractor's negligence shall be corrected without cost to the Owner.

3.05 LAWNS:

A. Watering: Check for moisture penetration throughout the root zone at least twice a month. Water as frequently as necessary to maintain healthy growth of turfgrass.

B. Mowing and Edging:

1. Edge the turf areas to keep in bounds. Trim top growth as necessary to achieve an overall even appearance.
2. Fescue turf grass shall be mowed weekly to a height of 1-1/2"min., 2" max. height.
3. Collect and dispose off site all grass clippings.

C. Fertilizing: In the first week of each month commencing 30 days after the start of the maintenance period apply ammonium nitrate fertilizer at the rate of 1 pound of actual nitrogen (4.75 pounds) 21-0-0 ammonium sulfate per 1000 square feet of turf area. Uniformly distribute fertilizer by use of mechanical spreaders or throwers.

1. Do not apply fertilizer to wet grass.
2. Apply fertilizer after the morning dew has dried but before the peak heat of the afternoon.

D. Water all turf stations for two consecutive cycles following application of fertilizer.

3.06 INSECTS, PESTS, AND DISEASE CONTROL:

A. Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:

1. Presence of insects, moles, gophers, ground squirrels, snails and slugs in planting areas.
2. Discolored or blotching leaves or fronds.
3. Unusually light green or yellowish green color inconsistent with normal green color of leaves.

B. Personnel: Only licensed, qualified, trained personnel shall perform spraying for insect, pest, and disease control

C. Application: Spray with extreme care to avoid all hazards to any person or pet in the area or adjacent areas.

3.07 IRRIGATION SYSTEM:

A. General: Repair without additional cost to the Owner all damages to system caused by Contractor's operations. Perform all repairs within one (1) watering period.

1. Report promptly to the Owner all accidental damage not resulting from Contractor's negligence or operations.
2. Do not run the irrigation system during rainy season. Set and program automatic controllers for seasonal water requirements.
3. Twice a month, use a probe or other acceptable tool to check the rootball moisture of representative plants as well as the surrounding soil.

B. Cleaning and Monitoring the System: Continually monitor irrigation systems to verify that they are functioning properly as designed. Make program adjustments required by changing field conditions.

1. Clean strainer at least once a year and as often as necessary to keep the irrigation systems free of sand and other debris.
2. Prevent spraying on walks, windows and building walls by balancing the throttle control on the remote control valves and adjustment screws on sprinkler heads. Do not allow water to atomize and drift.

3.08 TERMINATION OF THE MAINTENANCE PERIOD:

A. Final Acceptance Procedure: Work will be accepted by the Owner upon satisfactory completion of all work, including maintenance period, but exclusive of replacement of materials under the warranty period. Submit a written request to the Owner for review for Final Acceptance at least five (5) working days prior to anticipated Final Review date, which is at the end of the maintenance period.

B. Corrective Work: Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.

1. Perform corrective work and materials replacement in accordance with Drawings and this Section and shall be made by the Contractor at extra no cost to the Owner.

2. After all corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.
3. Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and accepted.

C. Conditions for Acceptance of Work at End of Maintenance Period:

1. Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
2. Replace all plants not meeting these conditions. An additional warranty period equal in length to the original shall be commenced for all such plants and planted areas.

D. Final Acceptance Date: The date on which the Owner issues a letter of final acceptance. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the landscaping work.

3.09 CLEANING: conform to Section 01740. Dispose of all pruned materials, vacuum all lawn clippings and leaves, sweep all walkways and rake smooth all mulched areas. Remove from the site all containers and evidence of maintenance activities.

3.10 CLOSE OUT:

A. Landscape Maintenance Record: Submit binder to Owner with all documentation and records required and utilized during the maintenance period.

B. Keys and Identification: Return all keys and identification materials supplied by the Owner for the purpose of site access.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section.

A. Section includes:

1. Forms for cast-in-place concrete.
2. Shoring, bracing, accessories and form coating.

B. Work installed but furnished in other Sections:

1. Inserts, bolts, anchors and other items furnished by other trades for installation in formed concrete.

C. Related work:

1. Division 3 for shotcrete and concrete finishing.
2. Division 4 for shoring of masonry.

1.02 SYSTEM DESCRIPTION

A. Design requirements:

1. Engineer, fabricate, assemble and install concrete formwork to meet or exceed the criteria indicated and specified, to conform to the profiles indicated and to other requirements of the Contract Documents, to satisfy the requirements of the authorities having jurisdiction, and to provide a watertight, structurally sound, self-draining assembly.
2. If required by the authorities having jurisdiction, prepare and submit reviewed shop drawings, specifications, calculations and any other supporting data required for review and approval, and pay fees incurred, prior to beginning installation.
3. Engineering calculations for these assemblies shall bear the signature and seal of a California-licensed professional engineer.

1.03 SUBMITTALS: Refer to Section 01330.

A. Submit manufacturer's product data, specifications, typical installation details and other data as necessary to demonstrate compliance with the specified requirements for form materials, including coatings, release agents, ties and accessories.

B. Closeout: Submit Contractor's form and shoring removal record.

1.04 QUALITY ASSURANCE

A. Grading: Provide lumber and plywood grade-marked by a grading agency acceptable to the authorities having jurisdiction.

B. Installer's qualifications: Firm and individuals with a minimum of 3 consecutive years experience in the fabrication and erection of concrete formwork on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

1.05 HANDLING

A. Store materials outdoors, off the ground on pallets, protected with breathing type covers.

B. Handling: Handle form facing materials to prevent damages that could be transferred to finished concrete work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber forms: Douglas Fir or Hemlock.

B. Plywood forms: Simpson "B-Matte FormGuard" or equal overlaid plywood complying with US Product Standard PS-1, exterior grade and edge sealed, APA grade-stamped, or ABS, PVC, steel or FRP forms.

2.02 ACCESSORIES

A. Chamfer strips: Basis of design is for extruded PVC with 3/4-inch diagonal face, unless otherwise indicated, by one of the following:

1. The Burke Co.
2. Chemrex, Inc./Sonneborn Building Products
3. Or equal.

B. Form ties and spreaders:

1. Provide cone or snap ties designed to be completely removed from wall, or to break off and provide minimum 1-1/2-inch coverage over ends of the portion of snap tie remaining in the concrete, and which will not leave a hole larger than 1-inch diameter in the concrete surface.
2. Do not use wire ties, wood spreaders, or embedded types in which embedded portion is less than 1-1/2-inch from exterior face of concrete.

C. Form coating: Basis of design is for "Crete-Lease 880" by Cresset Chemical Co., or equal.

D. Prefabricated construction joint keyways: Basis of design is for "Key-Loc" joint system with all accessories by Form-A-Key Concrete Specialties Products. Other acceptable materials/manufacturers include the following:

1. SJ-7 Screed Joint by MedCo.
2. Or equal.

E. Form voids: High compressive strength polystyrene foam blocks, Styrofoam 40, 60 or 115 by Dow Chemical or equal.

F. Sealants: As specified in Section 07920.

2.03 FORMWORK REQUIREMENTS

A. General:

1. Form contact surfaces shall be clean, free from dents, holes and other imperfections.
2. Establish and maintain benchmarks, lines and controls necessary to achieve specified tolerances.
3. Take an accurate survey of the form location just prior to concrete pour.

B. Earth bank:

1. Except for exterior face of wall footings and grade beams that must be formed, earth banks may be used to form footings and grade beams if the soil is firm, neatly trimmed, and will retain concrete in the required size and shape.
2. Increase the concrete coverage as required by the authorities having jurisdiction when concrete is cast against earth.

C. Wood forms:

1. Construct with plywood panels as large as practicable.
2. For concrete permanently exposed to view, fill voids and imperfections in form contact surfaces with body putty sanded flush and smooth and seal joints between panels with tape specifically designed to seal forms, or other approved material, to prevent concrete leakage.

D. Re-use of forms:

1. Form materials may be re-used if they produce finished surfaces equal to finished surfaces where new form materials are used.
2. Before reuse, thoroughly clean, recondition in every respect, suitable for their re-use purpose.

E. Tolerances: To obtain cast-in-place concrete not exceeding the tolerances specified in Section 03300, except support form facing material to limit deflection to L/360 between supports for concrete exposed to view, and L/270 for all other concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct detrimental conditions before proceeding with installation.

3.02 FORMWORK INSTALLATION

A. Construction:

1. Comply with the applicable provisions of ACI 347, Guide to Formwork for Concrete, and APA Design/Construction Guide "Concrete Forming."
2. Rigidly support and construct forms to the lines, surfaces and profiles necessary to produce concrete to the design indicated.
3. Construct forms to be removable without prying against concrete.
4. Make forms tight, without cracks or holes, to prevent leakage of mortar or loss of fine particles from concrete.
5. Cover or fill holes that are not used, and cracks that have opened up, flush with adjacent surfaces.

B. Wales and studs: Provide wales and studs of adequate size and spacing to prevent form failure and to obtain concrete within the tolerances specified.

C. Ties and spreaders: Place ties as indicated on approved shop drawings, spaced and aligned as indicated, in plumb columns and level rows. Do not permit wood, other than built-in treated bucks or nailing blocks, to permanently remain in forms.

D. Form contact surfaces: As specified above, except that the plywood form facing material specified must be used for concrete permanently exposed to view. Forms for all other concrete may be constructed of plywood, fiberglass, plastic, or steel.

1. To eliminate joint offsets, block plywood edges that do not occur at bearing points.
2. Do not expose plywood edges to concrete.

E. Special features:

1. Corners: Miter or cope corners accurately and attach securely to the form facing material with adhesive or nails driven flush with the item being fastened. Avoid hammer marks.
2. Provide sharp, clean corners, without visible edges or offsets at intersecting planes. Back joints with extra studs or girts to maintain square intersections.
   a. Chamfers: Unless otherwise indicated, install chamfer strips in corners of forms.
3. Concrete details: Form offsets, keys, reglets, seats, pockets, anchorages, moldings, chamfers, blocking, screeds, drips, bulkheads and other required features as indicated or as necessary to receive or engage the work of other trades.
4. Openings, chases and recesses: Form as indicated or necessary to receive, pass and clear other work.

   a. Verify sizes and locations with other trades before forming. Closely coordinate the location of boxes, cans and sleeves furnished by other trades.
   b. Seal edges of cutouts and holes in plywood.

F. Form release agent: Thoroughly clean forms and coat with release agent prior to initial use (except when mill-oiled) and before each reuse.

1. Apply form coating before reinforcement is placed.
2. Apply form coating in accordance with its manufacturer's instructions and coverage rates. Do not over-apply.
3. Provide a coating of uniform thickness.

3.03 FORMWORK REMOVAL

A. Remove forms after concrete has developed sufficient strength to safely sustain its own weight and superimposed loads, as determined by testing field-cured concrete cylinders, but not sooner than specified in ACI 347, Paragraph 3.6.2.3.

G. Take care when removing forms that concrete surfaces are not marred or gouged, that corners are true, sharp and unbroken. Do not pry against concrete when removing forms.

H. Cut nails flush on concealed surfaces. Cutback tie wires and nails in exposed concrete surfaces at least 1-1/2-inch.

I. Remove rod and cone ties and separators or similar devices and pull.

END OF SECTION

SECTION 03200

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Reinforcing steel for cast-in-place concrete and shotcrete.
2. Supplementary parts and components, such as clips, fasteners, chairs, tie wires, and other miscellaneous accessories required for a complete installation.

B. Related work:

1. Division 3 for post-tensioned concrete.
2. Division 4 for reinforcing steel for masonry.

1.02 SUBMITTALS

A. Shop drawings:

1. Submit shop drawings prepared by a California-registered professional engineer showing fabrication, bending, and placement of concrete reinforcing.
2. Submit bar drawings and schedules with the corresponding placing diagrams.

    a. Comply with ACI SP-66.
    b. Indicate bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcing.
    c. Include special reinforcing required for openings through concrete structures.

3. Drawings shall be complete for any specific area of Project when submitted.

B. Certificates: Submit copies of mill reports prior to starting this work.

1. Mill reports shall contain the steel source, description, heat number, yield point, ultimate tensile strength, elongation percentage, bend test and chemical analysis.

    a. If the reports show material is satisfactory no tests will be required.
    b. For foreign steel, perform testing as specified below by a testing laboratory acceptable to the authorities having jurisdiction.
    c. Certification from any other sources is not acceptable.

2. Ensure material delivered for use is that represented by mill reports.
3. Obtain copies of mill reports, examine them, certify whether the material represented complies with Specifications requirements, and make distribution of reports as required. Report chemical composition of each heat, as determined by ladle analysis.

C. Test reports: Submit test data for reinforcing steel sampled and tested prior to starting this work.

1. Where materials proposed for use cannot be identified, pay for an approved testing laboratory to make one series of tests (tensile and bend) from each 2.5 tons, or fraction thereof, of each size and kind of reinforcing steel.
2. Include minimum 2 samples of sufficient length to allow tests to be made on the as-rolled bar.

1.03 HANDLING

A. Delivery:

1. Deliver reinforcing to the site bundled, tagged and marked; handle to prevent damage to material.
2. Use metal tags indicating size, length and other markings shown on placement drawings. Maintain tags after bundles are broken.

B. Storage:

1. Electrode storage: Comply with the combined recommendations of AWS and the electrode manufacturer for storage of electrodes. Do not use electrodes that have been wetted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing steel: ASTM A 615, Grade 60 and for reinforcing steel to be welded, ASTM A 706, Grade 60.

B. Welded wire mesh: ASTM A 185. Provide in flat sheets, not rolls.

C. Welding electrodes: AWS A5.1 E70XX Series, low hydrogen, having a minimum yield point of 60,000 psi.

D. Tie wire: ASTM A 82, 16-gage (minimum) annealed steel wire.

E. Supports for reinforcing: Provide bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire mesh in place. Use wire-bar-type supports complying with Concrete Reinforcing Steel Institute (CRSI) specifications.

1. Slabs-on-grade: Provide supports with sand plates or horizontal runners where base material will not support chair legs, or precast concrete block chairs with embedded wire ties.
2. Exposed concrete surfaces: Where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
3. Over waterproof membranes and vapor retarder: Provide precast concrete chairs to prevent puncturing of membrane.

2.02 FABRICATION

A. General: Except as modified by the Contract Documents, comply with Chapter 7 of CRSI Manual of Standard Practice for fabrication of reinforcing steel.

B. Bending and forming:

1. Fabricate steel bars, wire and welded wire mesh to sizes, lengths and gages indicated.
2. Accurately form to shapes by methods that will not damage the materials.
3. Heating of reinforcing for bending is not permitted.

C. Tolerances: Comply with ACI 117.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION

A. Clean reinforcing of loose mill scale, excessive rust, oil, and other coating that might destroy or reduce its bond before placing it.

3.03 PLACING

A. Place reinforcing under the continuous inspection of the Owner's Testing Agency.

B. Placing: Comply with the listed reference standards as applicable. Do not install bars with unscheduled kinks or bends.

C. Spacing of reinforcing: Space reinforcing to maintain proper distance and clearance between parallel bars and between bars and forms.

D. Floor system reinforcing: Do not place until concrete in walls and columns has been placed and forms and projecting steel have been thoroughly cleaned.

E. Splices:

1. Do not splice reinforcing bars except where indicated.
2. At lapped splices, bars shall be in contact, unless noted otherwise on the Drawings, and shall be firmly wired together before placing concrete.
3. Extend stubs and dowels required to receive and engage subsequent work a sufficient length to develop the strength of the bar.
4. Place dowel and stub bars in the forms and secure against displacement during placing of concrete.

F. Welded wire mesh reinforcing:

1. Straighten and cut to required size where required and lay flat in place.

   a. Lap welded wire mesh one full mesh plus 2 inches.
   b. Securely wire together and to other reinforcing at approximately 24 inches o.c.

2. In concrete slabs-on-grade, extend welded wire mesh to within one inch of expansion, construction and contraction joints. As concrete is placed, chair welded wire mesh to ensure proper embedment at position indicated.
3. In concrete slabs on steel deck, extend welded wire mesh through construction joints 12 inches minimum. Lift welded wire mesh as concrete is placed to ensure proper embedment at position indicated.

G. Clearance: Maintain clear distances between reinforced steel and face of concrete indicated on the Drawings.

3.04 WELDING

A. Welding: Comply with the requirements of AWS D1.4, Structural Welding Code – Reinforcing Steel.

1. Before welding, determine the weldability of reinforcing bars by laboratory chemical analysis of the steel. Only steel conforming to the chemical requirements specified in AWS D1.4 may be welded.
2. Use only welders who have passed the AWS standard qualification tests within the previous year.
3. Clean bars of oil, grease, dirt and other foreign substances, and flame-dry before welding.
4. Prepare ends of bars in compliance with AWS D1.4.
5. Preheat bars before welding

B. Welded splices:

1. Use full penetration butt welds made by the electric-arc method unless indicated otherwise.
2. Weld splices shall develop 125 percent of the specified yield strength of the reinforcing bars, or of the smaller bar in transition splices.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Cast-in-place concrete (CIPC).

B. Related work:

1. Division 3 for concrete forms, concrete reinforcing, shotcrete, lightweight insulating concrete and post-tensioned concrete.
2. Division 7 for methane barrier under slabs-on-grade.

1.02 SUBMITTALS

A. Data:

1. Product data: Submit manufacturer's product data, specifications, typical installation details and other data as necessary to demonstrate compliance with the specified requirements for all manufactured products.
2. Design data:

a. Submit pit source and characteristics of each type aggregate to Architect prior to designing mixes.

b. Submit mix designs, and any subsequent changes in mix designs, prepared by a testing laboratory acceptable to the authorities having jurisdiction.

B. Certificates: Submit cement certificates, admixture certificates (including chloride ion content) and batch plant tickets and non-shrink grout test data.

1.03 QUALITY ASSURANCE

A. Uniformity: 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.

B. Installer's qualifications: Firm and individuals with a minimum of 3 consecutive years experience in the installation of cast in place concrete on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

C. Manufacturer's qualifications:

1. Firm experienced in manufacturing ready-mixed concrete products and complying with the requirements of ASTM C 94 for production facilities and equipment.
2. Firm certified according to the NRMCA Certification of Ready Mixed Concrete Production Facilities.

D. Testing agency qualifications: Independent testing agency acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

E. Preinstallation meeting:

1. At least one week prior to ordering specified materials or the start of concrete work, arrange a pre-installation meeting between the Contractor, Architect, Project superintendent, concrete supplier, and concrete finisher to review finishing techniques of concrete, use of additives, application of curing compounds and coordination with other trades.
2. Include inspection of the vapor retarder for proper joint seals, and unsealed penetrations.
3. Record minutes of the meeting, decisions made, and corrective measures to be taken before installation / application starts. Send copy of the minutes to the Architect no later than 3 days following the meeting.

1.04 PROJECT CONDITIONS

A. Do not place concrete when the temperatures of the materials in contact with the concrete, the concrete temperature, and the ambient temperature exceed the ranges recommended in ACI 305 and 306, or if it is likely to exceed these temperature before the concrete has taken its initial set, unless special precautions recommended by ACI 305 and 306 are provided.

1.05 SCHEDULING

A. Allow sufficient time in the construction schedule for appropriate slab drying, in accordance with the finish manufacturer's recommendations, for slabs to receive a moisture-sensitive deferred finish.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland cement: ASTM C 150, Type II. Do not change brand or type of cement without Architect's written approval.

B. Aggregates:

1. Hard rock aggregates: ASTM C 33, graded so that coarse aggregate nominal size is not larger than 1/5 of the narrowest dimension between form faces, nor 3/4 of the minimum clear spacing between individual reinforcing bars or bundles of bars, whichever is less, but never greater than 3/4-inch in any dimension for slabs 4 inches thick or less; 1-1/2 inches maximum at all other locations.
2. Lightweight aggregates: ASTM C 330, from sources approved by the authorities having jurisdiction.

C. Admixtures:

1. May be used only with the Architect and the Building Department approval.
2. Submit manufacturer's data for products proposed for use to the Architect in compliance with the requirements of Division One.

D. Water: Fresh, clean, and free of oil and other materials injurious to concrete.

2.02 ADHESIVES

A. Structural adhesive: Basis of design "Sikadur Hi-Mod" by Sika Chemical Corp. Other acceptable materials/manufacturers include the following:

1. "Patch and Bond Epoxy" by The Burke Co.
2. "Thiopoxy" by WR Grace.
3. "Rezi-Weld 1000" by WR Meadows.

B. Non-structural adhesive: Basis of design is for "Weldcrete" by Larsen Products Corp. Other acceptable materials/manufacturers include the following:

1. "Polyweld" by ChemMasters
2. "Concrete Bonding Adhesive" by WR Bonsal Co
3. Or equal.

2.03 CURING COMPOUNDS

A. General: Curing, hardening and sealing agents to be applied sequentially shall be products of single manufacturer. Where products of different manufacturers are used including proprietary topping and surfacing materials, confirm their compatibility with respective manufacturers.

1. Compound shall produce a uniform, continuous, adherent film that does not check, crack, or peel and is free from pinholes or other imperfections. Cure permanently exposed surfaces with a clear-type membrane-forming curing compound containing a fugitive dye.
2. Curing compound used on exposed concrete surfaces shall be non-discoloring, fast drying and shall be conclusively demonstrated not to darken or yellow with age.
3. Curing compound for use on concrete floors to receive adhered covering shall be specially formulated for such use and shall be certified by the manufacturer not to inhibit the bonding qualities of flooring adhesives. Refer to the Finish Schedule on the Drawings for specific finish materials and areas of application.

B. Compatibility: Use compound guaranteed not to affect the appearance of the concrete surfaces, and the bond, adhesion, or effectiveness of finishes or surface treatment specified herein to be applied to concrete.

C. Type I: Not used.

D. Type II cure only: ASTM C 309 Type 1, Class A and B, liquid membrane-forming, non-penetrating, fugitive dyed compound for interior or exterior use.

1. "Horncure 30D" by AC Horn, Inc.
2. "Day-Chem Rez Cure" by Dayton Superior.
3. "Kurez E-100S" by Euclid Chemical Co.
4. "Hydrocide Curing 309 Resin-Base" by Sonneborn-Rexnord.
5. Or equal.

E. Type III, cure and seal: Apply one coat for curing and second coat for sealing.

1. "Eucocure" by Euclid Chemical Co.
2. "Sure-Klean Cure & Seal" by ProSoCo, Inc.
3. "Kure-N-Seal" by Sonneborn-Rexnord.
4. "Polyclear" by Upco Co.
5. "Dekote" by WR Grace.
6. Or equal.

F. Type IV, Moist Cure, Hardener & Sealer:

1. "Hornolith Hardener" by AC Horn, Inc.
2. "Ashford Formula" by Curecrete Chemical Co., Inc.
3. "Day-Chem Sure Hard" by Dayton Chemical.
4. "Euco Diamond Hard" or "Surfhard Hardener" by Euclid Chemical Co.
5. "Saniseal 100 Hardener" by Master Builder.
6. "Lapidolith hardener" by Sonneborn-Rexnord.
7. Or equal.

2.04 SEALER

A. One of the following:

1. "Cure-Hard" by WR Meadows (sodium silicate).
2. "Ashford Formula" by Curecrete Chemical Co. (sodium silicate).
3. "Lapidolith" by Sonneborn (magnesium or zinc fluosilicate).
4. "Chem Hard" (magnesium fluosilicate), "Fluohard" (magnesium fluosilicate) or "Seal Hard" (siliconate/sodium silicate) by L&M Construction Chemicals, Inc.
5. Saniseal 50 by Master Builders Co. (magnesium or zinc fluosilicate).

2.05 MISCELLANEOUS MATERIALS

A. Evaporation retarder: Sealtight Evapre by WR Meadows, E-Con by L&M Construction Chemicals, Inc., or equal.

B. Water stop: Install the water stop at all subterranean locations and at other locations indicated.

1. Place water stop on the exterior face of the outermost dowel line, but keep a concrete cover of 2 inches minimum.
2. Butt ends of water stop and nail to concrete to avoid displacement during concrete placing and consolidation.

2.06 SOURCE QUALITY CONTROL

A. Employ a testing laboratory, acceptable to the Owner and Architect, to test the materials for conformance with these Specifications before concrete mixes are established, and when source is changed, unless recent test results of materials to be used on the Project, performed by an acceptable testing laboratory, are accepted by the Architect.

B. Testing coarse aggregates:

1. Test aggregates before and after concrete mix is established and whenever the character source of material is changed, but not less than one test for each 500 cu. yards.
2. Perform a sieve analysis to determine conformity with limits of gradation. Perform sampling and testing according to ASTM C 33, and as follows:

a. Sampling of aggregates: ASTM D 75. Take samples of aggregates at source of supply, or if source of supply has been approved, from storage bunkers at ready-mixed concrete plant.

b. Testing of aggregates shall include:

1) Sieve analysis: ASTM C 136.
2) Organic impurities: ASTM C 40. Fine aggregate shall develop a color not darker than the referenced standard color.
3) Soundness: ASTM C 88. Loss after 5 cycles not over 8 percent for coarse aggregate, nor 10 percent for fine aggregate.
4) Abrasion: ASTM C 131. Weight loss not over 10-1/2 percent after 100 revolutions, nor 42 percent after 500 revolutions.
5) Deleterious materials: ASTM C 33.
6) Materials passing No. 200 sieve: ASTM C 117, not over 1 percent for gravel, 1.5 percent for crushed aggregate per ASTM C 33.
7) Reactive materials: ASTM C 289. Aggregates shall indicate no potential deleterious reactivity.
8) Definitions: ASTM C 125.

c. Test lightweight structural aggregates in compliance with ASTM C 330. Report unit weight, tests for deleterious substances, unburned or under-burned lumps, loss of ignition, soundness, and staining materials.Cement test:

d. The cement mill laboratory will be acceptable as testing laboratory for this purpose when approved by the Building Department. Submit evidence to show that the cement mill laboratory is qualified to perform tests. The laboratory shall make tests for every 500 barrels or fraction thereof of cement used, in compliance with ASTM C 150.

e. Make tensile strength test at 7 days. Tag the cement for identification at the location of sampling. A representative of the Testing Agency shall certify that materials being used are taken from the lots sampled and tested for this report.

2.07 MIXES

A. Mix design:

1. Employ a testing laboratory, acceptable to the Owner and Architect, to design structural concrete mixes required for the Project to provide:

a. Concrete of the compressive strength indicated on the Drawings.

b. Adequate workability and proper consistency to permit concrete to be worked readily into the forms and around reinforcement without segregation and excessive bleeding.

c. Other requirements noted on the Drawings and specified herein

d. Design lightweight structural concrete for an air-dry density of 110 pcf, unless otherwise noted on the Drawings.

2. Determine proper proportions for design mixes in compliance with ACI 211 or ACI 318.
3. Determine proper water-cement ratio by preliminary test made in compliance with ASTM C 192.
4. Proportion and design mixes to result in concrete slump(s) at point of placement not exceeding the maximum recommended by ACI 301 and as accepted in the mix design.
5. Tests shall be conducted in compliance with ASTM C 39.

B. Concrete shrinkage test:

1. Before placing any concrete slabs, prepare a trial batch of the mix design, using the same aggregates, cement and admixtures (if any) proposed for use on the Project. Prepare at least 3 specimens for determining the "drying shrinkage" of the mix design.
2. The "drying shrinkage" specimens shall be 4-inch by 4-inch by 11-inch prisms, made, cured, dried and measured as specified in ASTM C 157. Measure and report separately for 7, 14, 21 and 28 days of drying, after 7 days of moist curing. The effective -gage length of the specimens shall be 10 inches.
3. The average "drying shrinkage" of the test specimens after 28 days of drying shall not exceed 0.052 inch.

C. Submit reports showing results of sieve analysis, mix design and results of compression tests.

1. Make test specimens from not less than 3 batches of each design mix.
2. The trial batch strength for each mix shall exceed indicated f'c by 25 percent or a lesser amount based on standard deviations of strength test records according to ACI 318.
3. Do not start concrete production until mixes have been reviewed and are acceptable to the Architect.

D. For each batch, weigh the fine and coarse aggregate separately, measure cement and water separately and introduce separately into the mix so that proportions can be accurately controlled and easily checked.

E. Do not change proportions established by the accepted mix design without the Architect's written approval.

1. Cement: If concrete develops less than required minimum strength, adjust mix proportions and increase the amount of cement, as necessary.
2. Water: Do not exceed predetermined amount of water because of slowness of discharge from mixer or any other reason, but reduce water to minimum necessary to produce concrete that will work readily into corners and angles of forms and around reinforcements, without segregation of materials and without free water collecting on the surface.
3. Aggregates: Reasonable variations in grading will be allowed by the Architect because of characteristics of available materials and the need for workability and strength.

F. Concrete mixing:

1. Mixing and delivery shall comply with ASTM C 94, these Specifications, and Building Code requirements.
2. Owner's Testing Agency will perform check sieve analysis of the aggregates being used, check compliance with mix design and the cement being used against mix design; check that water has been removed from the drum before adding mix ingredients for the following load and shall witness the loading of mixing trucks. The Owner's Testing Agency will send a written report of each inspection to Architect indicating compliance with these Specifications.
3. In addition to the requirements of ASTM C 94 section 16.1, provide the following information on delivery tickets signed by an authorized representative of the batching plant with each mixer truck of concrete delivered to the site.

a. Type and brand of cement.

b. Cement content per cubic yard of concrete.

c. Maximum size of aggregate.

d. Total water content expressed as water/cement ratio.

e. Time batched.

4. Deliver batch tickets to Inspector at the site when concrete is delivered.
5. Maintain equipment in proper operating condition, with drums cleaned before charging each batch. Schedule rates of delivery in order to prevent delay of placing the concrete after mixing, or holding dry-mixed materials too long in the mixer before the addition of water and admixtures.
6. Remove all materials, including water remaining in the ready-mix truck drum, completely before ingredients for the following loads are introduced in the drum.
7. Do not use concrete that has not been placed 30 minutes after leaving the mixer, or concrete that is not placed within 60 minutes after water is introduced into the mix.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. As applicable for each placing operation, verify accuracy of lines, levels, elevations and dimensions for excavations, subgrade, vapor retarder and formwork.

C. Verify reinforcing and accessories for proper position, sizes, clearances, fastenings, laps and splices.

D. Verify that no methane barrier damage has occurred since the pre-installation conference inspection.

1. Repair damage to achieve complete and continuous methane barrier membrane.
2. Grade sand covering the methane membrane to provide a layer of uniform thickness. Wet so that concrete is placed on damp sand.

E. Verify that steel deck joints are sealed and that there are no openings or voids that will permit concrete leakage.

F. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION

A. Place items to be embedded in concrete, including but not limited to, conduits, sleeves, nailers, anchors and rough hardware, built into concrete as indicated or required.

1. Do not embed piping and conduits, other than steel electrical conduits, in structural concrete. Locate conduits so as to reduce strength of the structure the least amount, as approved by the Architect, and as indicated on the Drawings. Do not embed conduits or piping in structural concrete on metal decks.
2. Embed bolts, inserts and other items in the concrete. Secure accurately so that they are not displaced during concrete placing, compacting and finishing operations. Wire tie, nail or bolt embeds securely to forms.
3. Set embedded bolts for materials and equipment attached to concrete to template, layouts and shop drawings. Verify size, length and location of electrical conduits with respect to equipment supports.
4. Fill voids in sleeves, inserts and anchor slots temporarily with readily removable material to preent entry of concrete in the voids.
5. Install expansion joint fillers where indicated, and as required to isolate concrete slabs-on-grade from other building elements such as walls and equipment pads. Cover filler with plastic joint cap and leave in place until ready to receive sealant.

B. Moisten, do not saturate, earth subgrade and bearing surfaces. Do not place concrete on muddy subgrade.

C. Wet wood forms thoroughly when they are not treated with form release agent. Wet other materials sufficiently to reduce suction and maintain concrete workability.

D. Install the water stop in all construction joints below grade, and elsewhere as indicated.

1. Place water stop in a continuous ribbon on the exterior face of the outermost dowel line. Keep a concrete cover of 2-inch minimum.

2. Unless otherwise recommended by the manufacturer, butt ends of water stop and nail to concrete to avoid displacement during concrete placing and consolidation.

E. Mask areas to receive sealants, caulking compounds or waterproofing/coatings before application of curing or sealing agents.

F. Do not proceed with placement of concrete until conditions are satisfactory.

3.03 CONVEYING

A. Rapid handling: Transport concrete from the mixer to location of placing as rapidly as practical to avoid separation or loss of ingredients.

B. Transporting methods: Use pipes, cranes, carts, buggies or other approved means to deliver concrete to final locations. Do not use delivery systems (pipe, chutes, etc.) formed of aluminum for transporting concrete.

C. Free fall:

1. As dictated by job conditions at each location, but not more than 4 ft. where concrete will be exposed in the Work and 6 ft. at all other locations.
2. Avoid large concentration of concrete in one location that would produce unacceptable deflection in supporting formwork or steel decking.

D. Concrete flow:

1. Keep surface of concrete level during placing with a minimum of concrete allowed to flow from one position to another.
2. Carry concrete up uniformly for the length of walls being placed to reduce lateral flow of concrete to 5 ft. maximum.

E. Runways: Construct substantial runways and scaffolding to avoid movement and vibration in the forms and reinforcing steel as a result of transporting and placing concrete.

3.04 PLACING

A. General: Comply with ACI 304. Do not place concrete in or under water.

B. Consolidation: Thoroughly consolidate concrete and work it around reinforcement and embedded items and into corners and angles of forms, by spading, rodding and tamping to exclude rock pockets, air bubbles and "honeycombs" and to obtain required density and strength.

C. Internal vibration:

1. Use mechanical vibrators to consolidate each layer with that previously placed, to completely embed reinforcement and fixtures, and to bring fine materials to the faces and top surfaces to produce the proper finish.
2. Assign at least one workman at each location where concrete is being placed to vibrate and consolidate the concrete in forms. Do not "over-vibrate" to prevent separation of ingredients.
3. Keep extra standby vibrator at the site.
4. Do not use vibrator to move concrete.

D. Flow of concrete:

1. Keep surface of concrete level during placing, with a minimum of concrete allowed to flow from one position to another.
2. Place concrete in a continuous operation until each section or panel has been completed.

E. Record: Keep records showing location, date and time of placement and quantity of concrete placed on the Project.

F. Floor slabs: Shape slabs to the levels, slopes and elevations indicated and accurately pitch or grade to drainage fittings and fixtures installed in them. Where indicated, depress slabs to receive other finishes.

G. Wall supported elements:

1. Under normal weather conditions, wait at least 2 hours after depositing concrete in walls and columns before placing concrete in supported floors.
2. Consider beams, girders, capitals and brackets as part of the floor systems.

H. Construction joints:

1. Location: Locate joints to least impair the strength and appearance of the structure. Obtain the Architect's approval of construction joint locations before casting concrete. In general construction joints shall be located as follows, unless otherwise indicated on the Drawings.

   a. In walls locate at the underside of floors or slabs, and at the top of footings or floor slabs.

   b. In slabs-on-grade locate joints where shown on the Drawings; offset not less than 5 ft., with a minimum of 2 offsets. Allow proper time lapse in placing of floor sections adjoining prior placings.

   c. In all cases make construction joints perpendicular to the main reinforcement. Continue reinforcement across joints, unless otherwise indicated.
2. Provide keyways at least 1-1/2-inch deep in construction joints in slabs, and between walls and footings; use prefabricated bulkheads specified for slabs in Section 03100.
3. Keep exposed face of construction joints continuously moist from time of initial set until subsequent placing of concrete against them, but not to exceed the curing period. When not damp, wet (do not saturate) the contact surface of joints for a minimum of 24 hours before placing adjoining concrete.

   a. Before placing adjoining concrete, clean contact surfaces to remove laitance, loosened particles of aggregate or damaged concrete, and expose sound, coarse aggregates solidly embedded in the matrix.

   b. To achieve the above, the contact surface may be washed with clean water under pressure (jet blast), may be sandblasted, or in areas which will be concealed from view when the building is completed an approved structural adhesive may be used on clean, structurally sound concrete. Remove wash water entirely from surface.

   c. If a contact surface becomes coated with foreign materials of any nature after being cleaned, clean again to suitable condition.

I. Site tolerances: Finish surfaces to a tolerance of 1/8 inch in 10 feet when measured with a 10-foot straightedge placed anywhere on the surface. Variation from level likewise shall not exceed 1/8-inch overall.

3.05 FINISHING

A. As specified in Section 03350.

3.06 CURING

A. Formed concrete:

1. Wet the tops and exposed portions of formed concrete and keep moist until forms are removed.
2. If forms are removed before 14 days after concrete is cast, coat concrete with curing compound as specified for flatwork below.

B. Concrete flatwork:

1. For interior slabs not scheduled to receive a deferred finish: Curing/hardening compound Type IV.

   a. After finishing and as soon as it can be done without marring the finish, spray curing and hardening compound uniformly in compliance with its manufacturer instructions submitted to the Architect, as specified above.

   b. When the manufacturer recommends a coverage range, use the heavier application unless otherwise permitted by the Architect.

c. Examine at regular intervals that the compound film is intact. If damaged, moisten the concrete and apply additional compound.

2. For all other concrete flatwork: Curing compound Types II and III:

a. Promptly after finishing, apply curing compound uniformly by spray as described above for sealer.

b. Examine at regular intervals that the compound film is intact. If damaged, moisten the concrete and apply additional compound.

C. Protection: Unless otherwise recommended by the curing compound manufacturer, restrict traffic on treated slabs for a minimum of 8 hours under normal conditions.

3.07 MISCELLANEOUS CONCRETE WORK

A. Provide all other concrete work indicated or required to complete the Work, even though not specifically specified, including the following.

B. Equipment bases and foundations:

1. Provide machine, and equipment bases and foundations where indicated on Drawings.
2. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of the manufacturer furnishing the machines and equipment.

C. Construct stairs, pits, trenches, curbs, integrally cast equipment pads and other miscellaneous concrete work to the profiles and dimensions indicated.

D. Concrete fill in stair tread and landing pans: Coat steel with bonding agent and fill pans with a mix with coarse aggregate passing a 3/8 inch sieve to obtain a compressive strength of 3,000 psi at 28 days. Reinforce with 2- by 2-inch by 16-gage welded wire mesh at midpoint.

E. Waterproof membranes:

1. Perform work over waterproof membranes to prevent damage to the membranes.
2. Schedule this work to reduce to a practical minimum the period when the installed membrane is left without protection.
3. Prior to placing concrete, inspect the membrane and repair damage that may have occurred.

3.08 FIELD QUALITY CONTROL

A. Site tests: The following will be performed by the Owner's Testing Agency.

1. Samples will be taken during progress of the work to determine slump, compression strength, aggregate sieve analysis, and grout-mix tests, with assistance furnished by the Contractor.
2. 3 cylinders will be made for each day's pour or for each 150 cu. yards. or once for each 5,000 sq. ft. of surface area, whichever is less, for each type of concrete being cast.
3. One cylinder will be tested at 7 days, and one cylinder at 28 days. The remaining cylinder will be kept in reserve in case tests are unsatisfactory.
4. For post-tensioned concrete, 1 additional cylinder shall be taken in addition to the 3 cylinders and at the same rate as specified above. The additional cylinder shall be tested at 3 days in addition to the 7 and 28 day tests.
5. Samples will be made in compliance with ASTM C 172.
6. Specimens will be made and laboratory cured in compliance with ASTM C 31.
7. The 28-day values will be the criteria for acceptance of concrete regarding strength only.

a. 7-day tests may be regarded as indicative of compliance or non-compliance with the 28-day strength requirements, and the Contractor should be guided accordingly in matter of adjusting proportions, if necessary, and notify the Architect.

b. 7-day tests shall also be a guide to the Contractor regarding time for form removal.

8. Slump tests will be made for each set of tests cylinders in compliance with ASTM C 143.

B. Tests evaluation:

1. Concrete cylinder test will be evaluated in compliance with ACI 214 and 318.
2. If 28-day test results indicate that concrete strength is not as specified, core concrete as directed by the Architect in compliance with ASTM C 42.

   a. Plug core hole solid as specified in Article 3.4 above.

   b. The cost of cores, tests and patching shall be borne by the Contractor.

3. In the event that additional core tests do not show strength required, or as determined by load tests made in compliance with ACI 318, the defective concrete shall be removed and replaced, or shall be reinforced as directed by the Architect, at the Contractor's expense.
4. If core tests results fall below design strength specified, adjust the concrete mix or water content for future batches, at no additional cost to the Owner.

C. Defective concrete:

1. Concrete which does not meet the requirements of the Contract Documents will be deemed defective.
2. Remove defective concrete as directed by Architect and replace with concrete meeting the requirements of the Contract Documents, at no additional cost to the Owner.

3.09 PROTECTING/CLEANING

A. Take suitable precautions in compliance with applicable ACI requirements to secure satisfactory concrete in either hot or cold weather.

B. Restrict construction vehicular traffic on slabs-on-grade to prevent damage and staining.

C. Protect concrete to prevent damage and staining.

D. Protect work of other trades from damage by work of this Section with heavy Kraft paper securely taped in place.

1. Maintain protection in effective condition for as long as need for protection exists.
2. Control use of water within the building so that no damage to previously installed work or existing structure and finish will occur.

E. Upon completion, wash and clean exposed concrete and leave free of oil, paint, plaster and foreign substances, ready to receive applied finishes or to be left exposed.

END OF SECTION

SECTION 03350

CONCRETE FINISHING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Perform and provide all concrete finishing required to complete the Work, except for concrete finishing specified to be performed under other Sections.

A. Work Included:

1. Samples and submittals.
2. Finishing of exposed formed concrete.
3. Final slab finishing and curing.
5. Concrete stair finish.
6. Metal stair strips.

B. Related Work:

1. Furnishing, erection, and removal of forms.
2. Furnishing, placing, patching, and initial curing of cast-in-place concrete unless otherwise specified.
3. Concrete fill in steel pan stair systems.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit for the following:

1. Abrasive aggregate.
2. Curing-sealer-hardener.
3. Metal stair strips.
4. Color admixes.

B. Samples:

1. Color Samples: Refer to the Drawings, obtain the Architect's color instructions as necessary, and submit a range of manufacturer's corresponding standard colors for the following:

a. Abrasive aggregate.
b. Color admixes.

C. Site Samples: Prepare following Samples at the site, cast in the directed locations and orientations. Prepare as many Samples of each type of concrete as are required for approval. Remove Samples from the site when no longer needed and removal is approved. Approved Samples may be part of permanent construction if meeting all other requirements shown and specified and are so approved. Use form and concrete materials previously approved under Sections 03100 and 03300.

1. Slab Samples: Prepare minimum 4-foot square Samples of each required slab finish excluding only natural cement color steel float and trowel finishes. Include all integrally colored concrete slabs, expansion joints, scoring, and edging.

1.03 QUALITY ASSURANCE: As specified in Section 03300.

A. Color Control for Integrally-Colored Concrete: Coloring admix and color control procedures of the L.M. Scofield Company, Los Angeles, CA, Davis Colors, or of Admixtures, Inc., Irwindale, California are specified to establish the standard of quality for all integrally colored concrete. Color admix manufacturer shall furnish the

services of its technical representatives equipped with wet-batch color control test devices at ready-mix plant and the site as required to assure concrete of uniform color matching approved Samples, at no extra cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS: Furnish finishing materials conforming to Section 03300, as applicable, and following requirements:

A. Acrylic Curing-Sealer-Hardener: Standard product acrylic curing-sealer-hardener meeting requirements of ASTM C309, by Burke, Sonneborn, or Dayton Superior.

B. Abrasive Aggregate: Norton "Alundum" or Union Carbide "Carborundum", graded #12 through #30 sizes, color as selected by Architect .

C. Metal Stair Strips: American Safety Tread Type 24 meeting California Code, 2" wide abrasive insert in "Safety Yellow" color, or equivalent by Wooster.

D. Color Admixes: L.M. Scofield "Chromix", Davis Colors, or "Colorfull Concrete Color" by Admixtures, Inc., Irwindale, Calif., matching Davis colors listed on the Drawings

PART 3 - EXECUTION

3.01 FINISHING EXPOSED FORMED CONCRETE: Surface patching and initial curing of formed concrete are specified in Section 03300. Rub surfaces with a carborundum brick or equal until smooth and free of form marks, offsets, and other defects, and in uniform planes. Wet rubbed surface and then brush coat with cement grout consisting of 1 part light-colored portland cement to 2 parts fine aggregate and mixed with water to the consistency of thick paint. Cork or wood float grout to fill all pits, air bubbles, and surface holes. Scrape off excess grout and rub surface with burlap or equal to remove all grout film. After grout sets, again coat with same grout, cure, then brick and burlap rub as necessary to eliminate remaining defects and blemishes, and damp cure surfaces for not less than 3 days or longer if required for complete curing of concrete. Finish, clean, and cure each surface as a continuous operation. Produce uniformly plane smooth surfaces free of grout film, grout or rubbing marks, defects, or blemishes after painting or covering with a flexible type finish material. Unless otherwise indicated or specified, apply this finish on exposed formed concrete.

A. Surfaces Excepted: Rubbed and grouted finish is not required on following surfaces:

1. Permanently concealed concrete.
2. Concrete exposed in mechanical, electrical, utility, storage, shaft, and similar non-public rooms and areas.
3. Wall and ceiling surfaces in interior parking areas, except the heads, jambs, and sills of openings in exterior walls shall be finished.

3.02 SLAB FINISHES: Produce finish slab surfaces level or sloped as shown with maximum deviation of 1/8" from a 10-foot straightedge. Keep surface moist with a fine fog spray of water as necessary. Dusting with dry cement or sand during finishing operations is not permitted. Finish all slab edges and joints with an edging tool. Match the approved Sample panels. Apply the following finishes as indicated, specified, directed, and applicable.

A. Rough Slab Finish: After initial set, coarse broom the slab surfaces and expose coarse aggregate. Apply on slabs to receive deferred mortar setting beds or cementitious toppings or slabs.

B. Monolithic Trowel Finish: For slab and flatwork surfaces not indicated or specified to receive another finish. After surface water disappears and floated surfaces are adequately hardened, steel trowel and retrowel concrete to a smooth surface. After concrete has set sufficiently to ring the steel trowel, retrowel to a smooth uniform finish free of trowel marks and blemishes. Avoid excessive retroweling which produces burnished areas.

C. Steel Float Finish: Same as for monolithic trowel finish except omit the second retroweling. Apply on following areas and surfaces:

1. Resilient floor covering areas.
2. Carpeted areas.
3. Elastomeric coating areas.
4. Thin-set tile areas.
5. Roof slabs.
6. Slabs to receive membrane waterproofing.
7. Slabs to receive fluid-applied elastomeric waterproofing or roofing.

D. Integrally-Colored Concrete: Provide integrally-colored concrete for the concrete slabs and surfaces so indicated or scheduled on the Drawings.

E. Swirl Non-Slip (Sweat Trowel) Finish: Same as for monolithic steel trowel finish less second retroweling. When ready, produce non-slip finish by circular motion and slight lifting of trowel, done in regular pattern. At walking areas, apply smooth finish 1" wide at all edges, expansion joints, and scoring. Apply on following surfaces:

1. Exterior vehicle traffic slabs.
2. Exterior concrete walks.
3. Other slabs where indicated or directed.

F. Broom Finish: Same as for monolithic steel trowel finish less the second retroweling. When ready, apply approved coarse texture finish by sliding a wire or stiff bristle broom in one direction along a straightedge guide set at right angles to the direction of traffic. At walking areas, smooth finish 1" wide at edges, expansion joints, and scoring. Apply coarse broom finish on concrete ramps for vehicles.

G. Abrasive Aggregate Finish: Same as the monolithic steel trowel finish except, just before performing retroweling, uniformly apply wetted abrasive aggregate at the rate of 1/4 pound per square foot minimum, and lock into cement matrix with the final retroweling. Lightly rub the hardened green concrete to expose grains and remove cement film. Apply on following surfaces:

1. Pedestrian ramps.
2. Treads of exterior concrete stairs.
3. Other slabs where indicated or directed.

H. Interior Parking Slabs: Apply swirl non-slip (sweat trowel) finish except apply monolithic steel trowel finish in parking stalls to enable easy removal of oil or grease.

I. Scoring: Provide where shown or directed, using tool of approved size and profile. Run score lines straight and of uniform appearance. If scoring is not indicated, obtain Architect's instructions not less than two working days before the day exterior slab concrete is placed.

3.03 SLAB CURING: Promptly apply curing media as soon as finishing is complete without marring surfaces, and in any case on same day. Apply liquid compound in accordance with manufacturer's published application rates; apply 2 spray coats, with second coat at right angle to first coat. Cover adjoining surfaces. Equip spray nozzles with a wind-shield suitable for wind conditions.

A. Curing Period and Protection: Maintain all curing media intact and sealed for 10 days minimum after application. Keep foot traffic on the curing surfaces to minimum possible and completely off liquid compound cured surfaces; vehicular traffic is not permitted on the surfaces until curing is completed. Immediately restore all damaged or defective curing media.

B. Restriction: Do not apply liquid membrane-forming curing compounds on any concrete to receive or bond to concrete or mortar, or on any surfaces to receive subsequent material or finish unless such use and the specific

compound used are approved by manufacturer of the material or finish to be applied, and verify all such use with related trades. Do not apply curing compounds on slabs to receive elastomeric or bituminous type coatings.

C. Liquid Membrane-Forming Curing Compound: Use on exterior slabs and paving but subject to above restriction. Do not use on interior slabs.

D. Sheet Curing: Use the specified curing sheet material. Seal all laps and edges with plastic pressure-sensitive tape, and immediately repair tears during the curing period. Verify that surfaces remain damp for the full curing period; if necessary, lift sheet, wet surfaces with clean water, then replace and reseal the sheeting. Use on surfaces where curing compound is not permitted.

E. Water Curing: Option to either liquid membrane-forming curing compound or sheet curing method. Keep concrete continuously wet for entire curing period.

F. Acrylic Curing-Sealer-Hardener: On interior slabs to remain exposed, apply acrylic curing-sealer-hardener immediately after slab finishing is completed, one coat spray applied according to manufacturer's directions. Just before inspection for Substantial Completion, clean slabs of dirt, dust, oil, grease, and all other deleterious substances, and spray apply a second coat of acrylic curing-sealer-hardener to uniform coverage recommended in manufacturer's specifications for the slab texture. Acrylic curing-sealer-hardener may be used to cure interior slabs to receive resilient floor covering or carpet, subject to requirements of Paragraph "Restriction" above, and to cure all exterior slabs and paving. Verify the acrylic curing-sealer-hardener is compatible with integrally-colored concrete prior to use.

G. Roof Slabs: Cure by sheet curing or water curing method only.

3.04 CEMENT FILL IN STEEL PAN STAIR SYSTEMS: Refer to Section 03300 for concrete fill in steel stair pans and landings, and for reinforcement. When fill is ready, apply a light non-slip texture float or broom finish across stair run on treads and swirl non-slip finish on landings. Cure with curing-sealer-hardener. Provide metal stair strips as specified below.

3.05 CONCRETE STAIR FINISH: Slope stair treads 1/8" from base of the risers to the nosings. Run nosings straight and level to rigid templates. Form risers as indicated or directed, and apply burnished steel trowel finish. On landings and treads, apply light non-slip texture float or broom finish across stair run and cure all concrete stair surfaces with curing-sealer-hardener. Provide metal stair strips as specified below.

3.06 METAL STAIR STRIPS: Run metal stair strips level with the top surface in same plane as stair tread or landing, in 1-piece lengths without splicing where feasible. Anchor according to manufacturer's instructions. Run strips for full stair width, except stop the metal strips 3" from edges of concrete stair treads and landings where such edges remain exposed and unbordered by walls, stringers, or curbs, set about 1" back from the nosing unless otherwise indicated. At all landing nosings and at the nosing of bottom treads in each stair run, install strips in Code conforming "Safety Yellow" color as approved by the Architect.

END OF SECTION

SECTION 03370

SHOTCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Shotcrete (pneumatically-applied concrete).

B. Related work:

1. Division 3 for formwork and reinforcing steel for shotcrete.
2. Division 3 for cast-in-place concrete.

1.02 DEFINITIONS:

A. Shotcrete: Air-placed, mixture of Portland cement, aggregates and water furnished as ready-mix and pumped in a plastic state to a nozzle where it is propelled by air pressure to its final placement position.

1.03 SUBMITTALS

A. Design data: Submit mix design for shotcrete, prepared by a testing laboratory acceptable to the authorities having jurisdiction, for minimum compressive strength indicated on the Structural Drawings, but the ratio of cement to aggregates, in loose dry volume, shall not be less than one cement to 4-1/2 parts of aggregate.

B. Qualification statements: Provide a list of projects of similar design and complexity completed within the past 5 years completed by the shotcrete installer.

1.04 QUALITY ASSURANCE

A. Installer's qualifications:

1. Member of the Gunite Contractor's Association and acceptable to the Structural Engineer, with a minimum of 5 consecutive years experience in the installation of structural shotcrete work on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.
2. Installer shall employ only experienced foremen, gunmen and nozzlemen on the Project. Satisfactory written evidence of such experience shall be supplied to the Architect when requested. Experienced workmen shall be used for all shotcrete finishing and curing.

B. Test panels:

1. Before beginning work, provide test panel(s) made by each application crew proposed for the Project at a location on the site acceptable to the Architect to demonstrate proposed shotcrete installation methods, testing, and finish.
2. Make test panel(s) 4-foot by 4-foot by the thickness of the wall, with typical reinforcing and representative of each shooting position to be expected in the Work.

a. Use the same equipment, personnel, materials and construction techniques intended to be used for the Project, including the selected cement, mix proportions, aggregates andformmaterials.

b. Demonstrate patching technique where directed.

c. Finish as specified.

3. Architect will review the test panel to determine if the Work falls within acceptable ranges for unevenness, appearance and workmanship.

4. After shooting, but before the concrete has fully set, the Testing Agency shall disassemble the panel(s) to assure that the team and equipment to be used is capable of providing sound shotcrete, free of voids, sags, segregation, honeycombing, lamination, dry patches, slugs and similar defects.
5. Make corrections requested by the Architect and the Testing Agency, or remove and replace mockup when corrective work is not acceptable. Repeat mockup(s) until Architect and Testing Agency's approval is obtained.
6. Application of shotcrete in the Work shall not proceed until the test panels have been disassembled, inspected and approved.
7. After approval remove debris from the Project site.

1.05 HANDLING

A. Delivery:

1. Protect materials from excessive moisture in shipment, storage, and handling.
2. Provide unopened containers and packages with original and intact labels bearing manufacturer's name, source of product and date of manufacture on package.

B. Storage:

1. Store cement in weathertight enclosures to protect against dampness and contamination.
2. Prevent segregation and contamination of aggregates by proper arrangement and use of stockpiles.
3. Store admixtures properly to prevent contamination, evaporation and other damage.

1.06 PROJECT CONDITIONS

A. Do not place shotcrete if there is a possibility of the ambient temperature falling below 32 deg. F or rising above 100 deg. F in the succeeding 24-hour period.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland cement: ASTM C 150, Type II.

B. Aggregate: Hard, sharp, natural, clean sand, free of organic matter, containing not more than 1 percent deleterious matter and conforming to ASTM C 33, graded as follows.

Sieve Size	Wet-mix
	Percent Passing
1/2-inch	100
3/8-inch	90
No. 4	95 - 100
No. 8	65 - 90
No. 16	45 - 75
No. 30	30 - 50
No. 50	10 - 22
No. 100	2 - 8

C. Water: From a domestic source and free from harmful amounts of acids, alkalis, organic or other deleterious material and with no pronounced odor or taste.

D. Proportions: Supply wet-mix shotcrete as ready-mix conforming to the Laboratory mix design. Refer to Section 03300.

E. Ground wires: Provide high-tensile ground wires of a material and thickness suitable for intended use.

2.02 EQUIPMENT

F. Air compressors: Furnish reliable air compressors, in good repair and capable of delivering the air pressure at the volume needed to produce the quality of shotcrete specified.

G. Equipment:

1. Pumps shall be either rotating roller squeeze pumps or positive displacement piston type in good repair and of adequate capacity.
2. Nozzle, hose, et cetera shall be in good repair and of a suitable length. All joints shall be tight.
3. Nozzle shall be no more than 1-5/8-inch in diameter and be equipped with an air ring.

H. An air lance handled by an experienced nozzleman shall be used at all times shooting is in progress to keep the area receiving shotcrete free of sand, water and other loose material.

2.02 MIXES

A. Comply with ACI 506.2, Specification for Materials, Proportioning and Application of Shotcrete.

B. Batching shall be done at an approved ready-mix plant and mixed by the truck prior to delivery to the job site. Materials shall be in place within 90 minutes after the first water is added.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Verify that waterproofing membrane has been inspected, approved and is undamaged before proceeding with installation.

C. Verify anchors, reinforcement, conduit and other embedded hardware is properly and securely in place to preclude any shifting or injury caused by the placement operations.

D. Verify reinforcement is free of loose scale, rust, all oil, spatters of previously placed shotcrete and other coatings that may interfere with bonding.

E. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION

A. Protection: Protect adjacent surfaces from staining and damage as required.

B. Cleaning:

1. Remove unsound and loose materials before shotcreting.
2. Clean dust and loose material from surfaces, forms and chases scheduled to receive shotcrete with compressed air and water to provide clean, sound bonding surfaces.

C. Wetting: Do not wet bentonite waterproofing materials before installation.

D. Backing:

1. Where there is a possibility of soil being dislodged during shotcreting, or where a void in the embankment is to be bridged, place rigid backing against the earth.
2. Should embankments slough or ravel during shotcreting, cease work in the affected area immediately, remove contaminated shotcrete, and provide a rigid backing as specified above.

E. Grounds: Place ground wires to accurately define the required finish surface planes. Keep wires tight at all times while in use.

3.03 PLACING

A. Comply with ACI 506, Recommended Practice for Shotcreting, and the following.

B. Provide a supply of clean, dry air adequate for maintaining sufficient nozzle velocity for all parts of the work and for simultaneous operation of a suitable blowpipe for clearing away rebound.

1. A nozzleman's helper equipped with an air jet shall attend the nozzleman and blow out all rebound, sand and loose material which may have lodged on forms, steel or shotcrete.
2. Provide additional workmen if required to keep the work area free of rebound if it cannot be removed by the air jet.

C. Place shotcrete using suitable delivery equipment and procedures that will yield in-place shotcrete meeting the requirements of the Drawings and these Specifications.

1. Shotcrete material shall emerge from the nozzle in a steady, uninterrupted flow.
2. If the flow becomes intermittent for any cause, the nozzle shall be diverted from the work until the flow again becomes constant.
3. All material deposited from the time the flow becomes erratic until the nozzle is diverted shall be cutout and replaced.
4. Discontinue shotcreting or provide suitable means to screen the nozzle stream if wind or air currents cause separation of the nozzle stream during placement.

D. Allow sufficient time between each layer of material placed to allow the previous layer to set.

1. Remove laitance by brushing before the material sets.
2. Remove laitance that has set by sandblasting prior to placing new layers.
3. Broom or scarify the surface of freshly placed shotcrete to which, after hardening, additional layers of shotcrete are to be bonded. Dampen surfaces just before application of succeeding layers.

E. Placement precautions:

1. Do not place shotcrete if drying or stiffening of the mix takes place at any time prior to delivery to the nozzle.
2. Do not use previously expended material in the shotcrete mix; rebounds may be re-used if they conform to the requirements for aggregates, but not in excess of 20 percent of the total aggregates in any batch.
3. Remove overspray or rebound before set and before placement of shotcrete on such surfaces.
4. Use high-tensile ground wires or other accepted means to establish thickness, surface planes, and finish lines of the shotcrete. Maintain specified tolerances by keeping wires secure and taut.

3.04 PLACEMENT AROUND REINFORCING:

A. Do not place shotcrete through more than one layer of reinforcing steel in one application unless demonstrated by pre-construction tests that steel is properly encased.

1. Test to see if voids or sand pockets have developed around or behind reinforcement by probing with an awl or other pointed tool after the shotcrete has achieved its initial set; by removal of randomly selected bars; or by coring or other suitable means.
2. In areas where congestion makes the proper placement of shotcrete difficult, use the dry method or the cast concrete as specified in Section 03300.

B. Hold nozzle at such distance and angle to place material behind reinforcing before any material is allowed to accumulate on its face.

1. Whenever possible, except when enclosing reinforcing steel, hold the nozzle at right angle to the shotcrete surface at a distance of 2-1/2 to 3-1/2 feet.
2. When enclosing steel, hold the nozzle to direct the material around the bars.

C. Site tolerance: Place shotcrete to provide 1-1/2-inch minimum cover over reinforcement. Minus tolerance on cover shall not be greater than 1/3 of the specified cover.

3.05 PLACEMENT AT OPENINGS

A. Place the remainder after initial shrinkage of the first layer has occurred.

1. The first layer of shotcrete shall completely encapsulate the reinforcing steel. Thick sections shall be placed in more than one layer.
2. Control thickness, method of support, air pressure, and water content of shotcrete to preclude sagging or sloughing off.
3. Limit the height of layers to 3 feet maximum. Do not place succeeding layer less than 3 hours after lower section is in place.

B. Fill corners of forms, and any area where rebound cannot escape or be blown free, with sound material.

C. Taper edges to leave no square shoulders at the perimeter of a cavity.

3.06 FINISHING

A. Finishing:

1. Finish unformed shotcrete surfaces to a uniform finish, as demonstrated on sample panel approved in advance by the Architect, and to a tolerance of no more than 1/4-inch in 10 feet, non-cumulative.
2. After form removal, patch voids and holes in formed shotcrete surfaces to match color and texture of adjacent surfaces.
3. Repair core holes in compliance with Chapter 9 of ACI 301. Do not fill core holes with shotcrete.

B. Curing:

1. Immediately after finishing, keep shotcrete continuously moist for at least 14 days after placement. Prevent rapid drying at the end of the curing period.

   a. Sprinkle with water so that surface is continuously wet.

   b. Where water spraying of exterior shotcrete would cause damage to the existing structure or finishes, use burlap or other absorptive mat or covering kept continuously wet.

   c. Elsewhere, apply water with a fog-type nozzle as often as necessary, using caution to avoid saturation or damage of adjacent surfaces or floors.

2. Shotcrete not scheduled to receive a separate finish can be water-cured for 3 days in the manner specified above, then an approved liquid membrane-forming compound applied in compliance with the manufacturer's written instructions.
3. Formed surfaces: If forms are removed during curing period, proceed as specified above. When forms remain in place, keep them continuously wet for a minimum of 14 days.

3.07 FIELD QUALITY CONTROL

A. Tests: No sooner than 4 days after placement of the concrete, take a minimum of three cores of each mix of shotcrete used each day, at the rate of one core for each 1,000 square feet of wall area, and a minimum of 2 cores for each day's application by any one nozzle team, at locations selected by the authorities having jurisdiction and the Architect.

1. Core size shall be 6 inches in diameter x full shotcrete thickness or 12 inches, whichever is less.
2. Prepare and test specimens in compliance with ASTM C 39 and C 42.

   a. Testing Agency shall visually examine the cores to make sure that they are free of voids and rebounds, and then replace the cores into the holes from which they were cut.

   b. Surface at the core shall then be sealed to prevent dehydration and shall be properly identified to aid in the recovery of the core at the conclusion of the 28-day curing period.

   c. After 28 days the cores shall be tested in compliance with ASTM C 42, except that no further curing shall be permitted.

B. Inspections: Deputy Building Inspector(s) employed by the Owner, qualified for shotcrete inspections and acceptable to the authorities having jurisdiction shall continuously inspect Shotcrete placement, including preparation, placement of reinforcing, finishing and curing.

3.08 PROTECTION

A. Protect shotcrete in place during the construction period to prevent damage and staining until acceptance by the Owner. Remove protection when no longer needed.

B. Remove and replace damaged shotcrete and shotcrete that does not comply with these Specifications, lacks uniformity, exhibits segregation, honeycombing, or lamination, or which contains dry patches, slugs, voids, or sand pockets, as determined and directed by the Architect, at no cost to the Owner.

3.09 CLEANUP

A. Leave areas around job site free of debris, equipment and related items after completion of job.

END OF SECTION

SECTION 03375

POST-TENSIONED CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Post-tensioning tendons complete with anchorage devices including normal and special accessories.
2. Post-tensioning devices.
3. Post-tensioning operation including marking, jacking and anchoring.

B. Related work:

1. Division 3 for concrete formwork.
2. Division 3 for other concrete reinforcing.
3. Division 3 for cast-in-place concrete.

1.02 DEFINITIONS

A. Anchorage: Means by which tensioning force is permanently transmitted from tensioned steel to the concrete.

B. Coating: Material used to protect against corrosion and/ or lubricate post-tensioning steel.

C. Coupling: Means by which tensioning force may be transmitted from one partial-length tensioned tendon to another.

D. Post-tensioning steel: Element of a tensioned tendon that is elongated and anchored to provide the necessary permanent post-tensioned concrete.

E. Sheathing: Enclosure around the post-tensioning steel to avoid temporary or permanent bond between the steel and the surrounding concrete.

F. Tendon: The complete assembly consisting of anchorage and post-tensioning steel with sheathing. The tendon imparts tensioning forces to the concrete.

G. Unbonded tendons: Tendons in which tensioning steel is permanently free to move relative to the concrete to which tendons are applying their tensioning forces. All tendons are unbonded.

1.03 SYSTEM DESCRIPTION

A. Design requirements:

1. General: Comply with ACI-318 "Building Code for Reinforced Concrete," as applicable.
2. Design, fabrication and erection of tendons, distribution plates and anchorages shall comply with AISC standards and AWS welding standards, including qualification test of welders.

1.04 SUBMITTALS

A. Data: Furnish complete tensioning procedure, including the following:

1. Jacking force and jacking pressure.
2. Maximum temporary jacking force and jacking pressure.
3. Certified jack calibrations and method of jack identification. Non-calibrated jack and pump combination will not be permitted.
4. Method of determining slack, if any.
5. Method of determining anchor force or force remaining in tendons after anchor.

B. Shop drawings: Submit drawings and calculations prior to fabrication of components. Include the following data.

1. Show tendon layout and dimension, locating tendons in horizontal plane at all points. Detail horizontal curvature of tendons at block outs and anchorages. Show all slab openings.
2. Indicate tendon profiles.

    a. Give chair heights and locations and all required steel placement.
    b. Show the location of each tendon, and the method of support.

3. Show details of reinforcing around stressing pockets and closures, and where interference with tendons may occur.
4. Include calculations of friction losses on shop drawings to verify design forces are obtainable. Furnish calculations or test results determining the adequacy of anchorages that may be required.
5. Show required elongation of each tendon at jacking point.

C. Test reports: Submit certified mill test results and typical stress-strain curves for post-tensioning steel:

1. Obtain the typical stress-strain curve using approved standard practices.
2. For steels not covered by ASTM A 416, submit the guaranteed tensile strength, yield strength, elongation, composition and other pertinent data to the Architect.
3. Provide samples from each lot, properly marked, for verification of post-tensioning steel quality.

D. Closeout submittals: Maintain records of elongation and tension applied to each wire. Submit records to the Architect at completion of tensioning operations.

1. At the time of stressing the first member of each type, check the stresses in the individual tendons to establish a procedure for insuring uniform results.
2. Be prepared to repeat the verification procedure at a later time, as directed by the Architect, should appearances suggest design stresses are not being obtained.

1.05 QUALITY ASSURANCE

A. Installer's qualifications:

1. Firm and individuals acceptable to the authorities having jurisdiction with a minimum of 3 consecutive years experience in post-tensioned structural concrete work on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.
2. Work shall be performed under the direct supervision of an individual with experience in the type of construction required on the Project. He shall exercise close checks and rigid control of all operations, as necessary, for full compliance with Contract Document requirements.

B. Testing and inspection agency requirements: Testing laboratory used for testing post-tensioned concrete shall have not less than 3 years experience in sampling and testing post-tensioned concrete assemblies of a similar type. Testing shall be under the direct supervision of a California-registered structural engineer.

1.06 HANDLING

A. Protect post-tensioning steel from rust, corrosion and bond reducing film.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with paragraph 15.2 of ACI 301, except when otherwise indicated on the Drawings, and the following.

B. Tendons: ASTM A 416.

1. Strands shall be Grade 270, 1/2 -inch diameter (0.153 square inch nominal area).
2. Strands not specifically itemized in ASTM A 416, including low relaxation strand, may be used provided they conform to the minimum requirements of these Specifications and have no properties which make them less satisfactory than those listed in ASTM A 416.
3. Tendons within each group of the same type of members shall be of the same heat where practicable. Tendons shall be assigned a heat number, and tag accordingly.

4. Provide sufficient protection for exposed post-tensioning steel at ends of members to prevent deterioration by rust or corrosion.
5. Wrap damages longer than 1 -inch in tendon sheathing with waterproof tape prior to concrete placement.

C. Distribution plates: ASTM A 36 for structural shapes or ASTM A 148 for cast steel, or higher quality materials as required to meet strain requirements.

D. Anchorages:

1. Anchorages of unbonded tendons shall develop at least 100 percent of the minimum specified ultimate strength of the post-tensioned steel without exceeding anticipated set.

   a. The total elongation under ultimate load of the tendon shall not be less than 2 percent measured in a minimum gage length of 10 feet.
   b. Average bearing stresses of the concrete created by anchorage plates shall not exceed the allowable code values.

2. Special reinforcing, required for the required performance of the anchorage, shall be designed, supplied and installed by the post-tensioning subcontractor. Reinforcing shall not be less than two No. 5 bars.

E. Coating: Coating for unbonded tendons shall permanently protect tendons against corrosion by a properly applied coating of non-volatile, low friction, mineral base grease, or other approved material. Coating shall have the following attributes.

1. Coating shall remain permanently ductile, and free from cracks, and shall not become fluid over the entire operating or anticipated temperature range.
2. Coating shall be chemically stable, have a rust-inhibiting additive and the non-reactive to cement and the material used for sheathing.
3. Coating material shall adhere to and be continuous over the entire tendon length to be unbonded and shall have a relatively uniform viscosity under temperature ranges of 20 to 120 deg. F.

F. Sheathing: Continuous plastic tube with the following characteristics.

1. Sheathing shall have sufficient tensile strength and be sufficiently waterproof to resist unrepairable damage and deterioration during transport, storage and installation.
2. Sheathing shall be continuous over the tendon length to be unbonded.
3. Sheathing shall prevent the intrusion of cement paste and the escape of the coating material.

G. Couplings of unbonded tendons: Use only a locations indicated.

1. Do not use couplings at points of sharp tendon curvature.
2. Couplings shall develop at least 100 percent of the minimum specified ultimate strength of the post-tensioned steel without exceeding anticipated set. Coupling of tendons shall not reduce the elongation at rupture below the requirements of the tendon itself.
3. Enclose couplings and coupling components in housings long enough to permit the necessary movements. Protect coupling components with coating material prior to final encasement in concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 INSTALLATION

A. Comply with paragraphs 15.4 and 15.5 of ACI 301 for placement and protection of tendons and accessories, and application of prestressing force.

B. Formwork: Comply with the requirements of Section 03100 of these Specifications, and paragraph 15.3 of ACI 301.

C. Tendon positioning: Provide suitable horizontal and vertical spacers, chairs and profile bars as required to hold the tendons in true position and to obtain a smooth profile and prevent displacement of tendon during casting.

1. Straighten tendons to ensure proper positioning.
2. Remove and replace tendons exhibiting fabrication defects.
3. Arrange concrete reinforcing as specified in Section 03200 and to suit the post-tensioning method.

D. Tendon anchorage: Secure tendons at the ends with approved anchoring devices that will prevent wires from kinking, necking down or otherwise be damaged.

1. Anchorage devices shall hold the tensioned steel without slip of more than 1/8-inch at a load equal to the applied load on the wire at stressing.
2. Distribution plates shall consist of welded steel or cast steel bearing assemblies that will support and distribute the load from the anchoring devices.

    a. Bending stresses in the plates induced by the pull of the tensioned steel shall not exceed 27,000 psi for structural steel and 15,000 psi for cast steel, except as test data may indicate that higher stresses are satisfactory.
    b. For higher strength steel, corresponding higher stresses may be permitted.

E. Tensioning: Do not begin tensioning tendons until concrete cylinder tests show concrete has attained a strength of 3,000 psi, and not until the concrete has cured for a minimum of 3 days. Cure cylinders under field conditions. Perform tensioning as follows:

1. Do not attempt tensioning until reasonable freedom from binding of the tendons in the enclosure is demonstrated.

    a. Assume satisfactory evidence of unbound conditions, if inward movement of steel is observed at on end of member when normal pull is applied to the opposite end.
    b. Consider as satisfactory evidence when not more than 5 percent between the observed and expected elongation after tensioning exists.
2. Tension tendons using hydraulic jacks, equipped with accurate reading calibrated hydraulic pressure gages, permitting the stress in tendons to be computed at any time.

    a. Provide a certified calibration curve with each jack.
    b. When inconsistencies between the measured elongation and the jack gage reading occur, recalibrate jack gages immediately.

3. Sequence of tensioning tendons: Tension tendons from the center of the building outward in both perpendicular directions to gradually and uniformly develop the desired stressing forces in the concrete, and as noted on Structural Drawings.
4. Stress from one or both ends of tendons. Make proper allowances for friction losses; check one tendon for friction loss at the start of tensioning.
5. Stress tendons at stressing points immediately after anchorage at a force of 189 Kips (0.70 by 270) or 28.9 Kips per strand. Verify tension in strands by both jack pressure gage and elongation methods per ACI 318.18. Elongation requirements shall be taken from average load-elongation curves for the strands used.
6. Anchor tendons at an initial stress that will result in the ultimate retention of working forces or stresses of not less than those shown on the Drawings, but at no time with tension of steel above 80 percent of the ultimate tensile strength of the wire. Do not permit initial stress remaining in steel, immediately after anchoring the tendons, to exceed 70 percent of the ultimate steel strength.
7. Remove and replace broken or bent strands, or strands showing severe fabrication or placement defects. Assume responsibility for damage caused by strands or other stressing steel breakage during tensioning operations.
8. Maintain the alignment of tendons, before, during and after placement of concrete.
9. Provide a line transfer method approved by the Architect in the forms to show the location of the tendons after deforming on the concrete soffits.
10. One day after stressing has been completed, and elongation has been verified, burn off the tendon one inch clear from the edge of the concrete. Fill void with non-shrink grout.

F. Site tolerances:

1. Tendon location: Do not exceed the following.

a. Deviation from straight line (sweep): 1/4 -inch/10 ft. by total length.
b. Deviation in location from specified tendon center of gravity: Plus 1/8 -inch
c. Concrete cover to tendons: Plus 1/4 -inch

2. Tensioning force: Do not exceed the following.

a. Individual tendon force or elongation: Plus 5 percent.
b. Total post-tensioning force or elongation: Plus 5 percent.

3.03 FIELD QUALITY CONTROL

A. Perform this work under the continuous inspection of the Owner's Testing Laboratory.

B. Inspection: Prior to placing concrete in the structure, the location and position of tendons shall be checked and approved by the Special Inspector.

1. Correct errors or discrepancies found before concrete is placed.
2. Review and approval will not relieve the Contractor from responsibility for compliance with Contract requirements.

C. Site tests:

1. Static test: Perform a static test on a representative specimen of tendon assembly consisting of standard production quality components at least 10 ft. long.

a. Test the assembly to allow accurate determination of the yield strength, ultimate strength and percent elongation of the complete tendon to ensure compliance with the Contract Documents.
b. The specimen used for the static test need not be one subjected to dynamic loading.

2. Dynamic tests: Perform dynamic tests on a representative specimen(s); the tendon assembly shall withstand, without failure, 500,000 cycles from 60 percent to 66 percent of its minimum specified ultimate strength; and also 50 cycles from 40 percent to 80 percent of its minimum specified ultimate strength.

a. The period of each cycle involves the change from the lower stress level to the upper stress level and back to the lower.
b. The specimen used for the second dynamic test need not be the same used for the first dynamic test.

3. The static and dynamic test requirements may be waived if recent test data are available. Such previous tests shall have been performed on tendon assemblies of a similar type and quality as this Project. Submit test report certified by a California-registered structural engineer.

END OF SECTION

SECTION 03520

LIGHTWEIGHT INSULATING CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Lightweight insulating concrete.

B. Related work:

1. Division 3 for cast in place concrete.

1.02 DEFINITIONS

A. Lightweight Insulating Concrete: Low-density concrete, with an oven-dry unit weight not exceeding 50 lb/cu.-foot and classified as follows:

1. Aggregate Lightweight Insulating Concrete: Low-density concrete made with Portland cement, water, air-entraining admixture, and vermiculite mineral aggregates.

1.03 SUBMITTALS

A. Data:

1. Submit manufacturer's product data, specifications, and other data as necessary to demonstrate compliance with the specified requirements for lightweight insulating concrete.
2. Submit proposed design mixes for lightweight insulating concrete.

B. Shop Drawings: Submit large scale, dimensioned shop drawings indicating materials and methods of installation. Provide plan drawings showing outline of roof areas, roof slopes and drainage patterns, lightweight insulating concrete thickness, roof penetrations, roof perimeter terminations and curbs, control and expansion joints, and roof drains.

C. Test reports: Submit reports from a qualified independent testing agency indicating physical properties of proposed materials comply with specified requirements based on comprehensive testing of current product formulations.

D. Certificates: Submit letter from lightweight insulating concrete manufacturer stating all materials meet or exceed the specified requirements.

E. Regulatory requirements: Submit evidence from a model code organization acceptable to authorities having jurisdiction of lightweight insulating concrete's compliance with the requirements of the authorities having jurisdiction.

1.04 QUALITY ASSURANCE

A. Installer's qualifications:

1. Experienced firm who has completed lightweight insulating concrete roof insulation systems 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.
2. Installer shall be approved by lightweight insulating concrete manufacturer.

B. Testing agency qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. Regulatory requirements:

1. Fire-test response characteristics: Where lightweight insulating concrete is part of a fire-resistive roof deck assembly, provide lightweight insulating concrete identical to that used in assemblies tested for fire resistance per ASTM E 119 by a testing agency acceptable to authorities having jurisdiction.

2. Fire-resistance ratings: Indicated by design designations from UL's "Fire Resistance Directory," from UL's "Directory of Listed Products," or from the listings of another testing and inspecting agency acceptable to the authorities having jurisdiction.
3. Asbestos: Provide vermiculite aggregates containing no detectable asbestos as determined by the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy".

1.05 HANDLING

A. Delivery:

1. Deliver materials to project site in original unopened packages, clearly labeled with manufacturer's identification labels intact and legible, indicating manufacturer's name, brand, type, source of product, date of manufacture, UL classification, expiration date and grade.
2. Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store materials indoors, off the ground on pallets, protected with breathing type covers.

C. Handling:

1. Inventory should be rotated. Do not use products whose shelf life has expired.
2. Do not use cement that shows indications of moisture damage, caking, or other deterioration.

1.06 PROJECT CONDITIONS

A. Do not place lightweight insulating concrete unless ambient temperature is 40 deg. F and rising.

B. Do not place lightweight insulating concrete during rain or on surfaces covered with standing water and frost.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Zonolite, Vermiculite aggregate lightweight concrete by Siplast Inc.

2.02 MATERIALS

A. Portland cement: ASTM C 150, Type I, II or III. Use only one type of cement.

B. Fly Ash: ASTM C 618, Class C or F.

C. Mineral Aggregate: ASTM C 332, Group I, vermiculite.

D. Water: Clean, potable.

2.03 ACCESSORIES

A. Joint filler: ASTM C 612, Class 2, glass-fiber type, compressing to one-half thickness under a load of 25 psi.

B. Steel wire mesh: Cold-drawn steel wire, galvanized, 19 gage, woven into 2-inch hexagonal mesh, and reinforced with a longitudinal 0.062-inch- diameter wire spaced 3 inches apart.

1. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Keydeck," Style No. 2160-2-1619, by Keystone Steel & Wire Company.

C. Galvanized plain-steel welded wire fabric: ASTM A 185, 3-1/2 by 3-1/2 inches, 16 gage, fabricated from galvanized steel wire into flat sheets.

2.04 AGGREGATE LIGHTWEIGHT CONCRETE

A. Design mix to produce lightweight insulating concrete with the following minimum physical properties using the minimum amount of water necessary to produce a workable mix.

1. Do not exceed maximum air content recommended by aggregate manufacturer.

B. Vermiculite Aggregate Mix:

1. As-Cast Unit Weight: 45 to 49-lb/cu.-foot at point of placement, when tested according to ASTM C 138.
2. Oven-Dry Unit Weight: 23 to 26-lb/cu.-foot, when tested according to ASTM C 495.
3. Compressive Strength: Minimum 140 psi, when tested according to ASTM C 495.
4. Cement-to-Aggregate Ratio, by Volume: 1:6.

2.05 MIXES

A. Prepare design mixes for each type and strength of lightweight insulating concrete by either laboratory trial batch or field-test data methods. For trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.

B. Limit water-soluble chloride ions to the maximum percentage by weight of cement or cementitious material permitted by ACI 301.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and surfaces to receive materials, and conditions under which materials will be installed.

B. Verify surfaces to receive lightweight insulating concrete are free from oil, grease, waxy films, curing compounds, release agents and other deleterious materials that would negatively affect the quality of installation, durability and material performance.

C. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION

A. Control joints:

1. Install at perimeter of roof deck and at junctures with vertical surfaces, including curbs, walls, and vents, for full depth of lightweight insulating concrete where required by lightweight insulating concrete manufacturer.
2. Fill control joints with joint filler.
3. Provide control joints of width recommended by the lightweight insulating concrete manufacturer.

B. Reinforcing mesh: Place steel wire mesh with longest dimension perpendicular to steel deck ribs. Cut mesh to fit around roof openings and projections. Terminate mesh at control joints. Lap sides and ends of mesh at least 6 inches.

C. Reinforcing fabric:

1. Place steel welded wire fabric with longest dimension perpendicular to steel deck ribs.
2. Cut fabric to fit around roof openings and projections.
3. Terminate fabric at control joints.
4. Lap sides and ends of fabric at least 6 inches.

3.03 MIXING AND PLACING

A. Mix and place lightweight insulating concrete according to manufacturer's instructions, using equipment and procedures to avoid segregation of mix and loss of air content.

B. Mix materials to obtain a homogenous mass that will flow freely and screed to a smooth, even surface.

C. Deposit and screed lightweight insulating concrete in a continuous operation until an entire panel or section of roof area is completed.

1. Place to depths and slopes indicated.

2. Do not vibrate or work mix except for screeding or floating.

D. Finish top surface smooth, free of ridges and depressions, and maintain surface in condition to receive subsequent roofing system.

E. Begin curing operations immediately after placement, and air cure for not less than three days according to manufacturer's written instructions.

F. If ambient temperature falls below 32 deg. F, protect lightweight insulating concrete from freezing and maintain temperature recommended by manufacturer for 72 hours after placement.

G. Site tolerances: Deviation of completed roof deck from theoretical lines shall not exceed 1/4-inch in 10-foot when measured at any point with a straightedge.

3.04 FIELD QUALITY CONTROL

A. Testing agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports evaluating lightweight insulating concrete according to requirements specified in this Article.

B. Testing agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports evaluating lightweight insulating concrete. Sampling and testing for quality control may include requirements specified in this Article.

C. Testing agency shall take samples according to ASTM C 172, except as modified by ASTM C 495, and comply with the following:

1. Determine as-cast unit weight during each hour of placement, according to ASTM C 138.
2. Determine compressive strength and oven-dry unit weight according to ASTM C 495. Make a set of at least 6 molds for each day's placement, but not less than 1 set of molds for each 5000 sq.-foot of roof area.
3. Report test results to Architect, Contractor, and lightweight insulating concrete Installer within 24 hours of completion of each test.
4. Perform additional tests when test results indicate as-cast unit weight, compressive strength, oven-dry unit weight, or other requirements have not been met.

    a. Retest cast-in-place lightweight insulating concrete according to ASTM C 513 for compressive strength and oven-dry unit weight.

3.05 PROTECTION

A. Do not permit traffic on lightweight insulating concrete until sufficient strength to withstand traffic without damage has developed.

B. Provide plywood panels or similar form of protection to prevent damage to the concrete when storing materials or performing work on lightweight insulating concrete.

C. Refinish, or remove and replace, lightweight insulating concrete if surfaces are excessively scaled or too rough to receive roofing, according to roofing membrane manufacturer's written requirements.

D. Remove and replace materials that are damaged, loose, chipped, broken, or that fails to comply with compressive-strength and oven-dry unit weight requirements, as determined and directed by the Architect, at no cost to the Owner.

END OF SECTION

SECTION 04220

CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Concrete masonry units (CMU).
2. Reinforcing steel for CMU.
3. Mortar and grout.
4. Supervising the work of other sections for necessary rough-in work, embeds and anchorage.
5. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

B. Work installed but furnished in other Sections: Division 5 for sleeves, inserts, steel lintels, bolts, anchors and similar items furnished by other trades for installation in masonry.

C. Related work:

1. Division 3 for reinforcing steel for concrete, including dowels in footings.
2. Division 8 for hollow metal doors and frames.

1.02 SYSTEM DESCRIPTION

A. Design requirements: The applicable provisions of ACI 530.1, Specifications of Masonry Construction, govern the work of this Section.

1.03 SUBMITTALS

A. Shop drawings: Comply with ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.

1. Submit large scale, dimensioned drawings, prepared by a California-registered professional engineer, indicating fabrication, bending, and placement of reinforcing.

   a. Show bar schedules and diagrams of bent bars.
   b. Submit bar drawings indicating arrangement and placing of reinforcing.

2. Provide elevation drawings of each plane to be constructed of CMU.

   a. Show location of all accessories to be mounted on or included in CMU construction, including electrical devices, openings and control joint locations.
   b. Include special reinforcing required for attachment to footings, for openings through CMU structures and for control joints.

3. Coordinate shop drawings with the work of other trades that are part of, or will be incorporated into, the work of this section. Indicate work to be performed by other trades, including adjacent and abutting materials to which this work is to be secured.
4. Drawings shall be complete for each specific area of Project when submitted.

B. Samples: Submit three 6-inch by 6-inch samples of each type of masonry unit showing full range of color and texture variations to be expected in the Work.

C. Test reports: Submit copies of mill reports and test data for reinforcing steel.

D. Certificates: Submit letter from the CMU manufacturer stating that all materials meet or exceed the specified requirements for grades, types or classes.

1.04 QUALITY ASSURANCE

A. Uniformity: Obtain each color, grade, type, composition, and variety of CMU used for the Project from the same manufacturer.

B. Regulatory requirements:

1. Comply with fire resistance ratings indicated and required by the authorities having jurisdiction.
2. Provide materials, accessories and application procedures listed by UL or tested in compliance with ASTM E 119 for the type of construction shown.

C. Mockup:

1. Before beginning work, erect a mockup at a location on the site acceptable to the Architect to demonstrate proposed CMU construction, installation methods, coordination of the work specified in other relevant sections, accessories, features.
2. The Architect will select mockup size and features, but in no case shall it be less than 6 feet long by 6 feet high with a 2-foot return.

    a. Use same personnel, materials and construction techniques intended to be used for the Project, including the selected cement and aggregates specified.
    b. Grout and point mockup as specified herein.

3. Architect will review the mockup to determine if the Work falls within acceptable ranges for unevenness, appearance and workmanship.
4. Make corrections requested by the Architect, or remove and replace mockup when corrective work is not acceptable. Repeat mockup(s) until Architect's approval is obtained.
5. Protect approved mockup, which will be used as a standard for all remaining work on the Project, until its removal is authorized. Remove mockup only after completion and final acceptance of CMU work.
6. When properly identified for future reference, and when acceptable to the Architect, the mockup may remain a part of the Work.

D. Certifications: Provide manufacturer's mill certificates with each shipment of reinforcing materials delivered to the jobsite certifying that material furnished complies with specified requirements.

1.05 HANDLING

A. Delivery:

1. Comply with applicable requirements of ASTM A 700 for packaging, loading and marking reinforcing steel materials.

    a. Use metal tags indicating size, length and other markings shown on placement drawings.
    b. Maintain tags after bundles are broken.

2. Deliver mortar and grout material in labeled, undamaged bags with the maker's name and brand distinctly marked thereon. Keep dry until used.

B. Storage: Store materials outdoors, off the ground on pallets, protected with breathing type covers.

1. Store reinforcing to prevent rusting.
2. Store CMU to prevent physical damage and staining.

C. Handling:

1. Protect materials from excessive moisture in shipment, storage, and handling.
2. Use caution not to damage CMU that will remain exposed in the Work.

1.06 PROJECT CONDITIONS

A. Do not begin work unless a temperature of 50 deg. F or more can be maintained without interruption, during and for 3 days after completion of masonry work.

B. Hot weather installation: Protect masonry erected when the ambient air temperature is more than 99 degrees F in the shade, and the relative humidity is less than 50 percent, from direct exposure to wind and sun for 48 hours after installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing steel: ASTM A 615, Grade 60.

B. Concrete Masonry Units:

1. Provide medium weight, load-bearing units conforming to ASTM C 90, Type N-1, except for special shape units.
2. Provide special shapes such as open-end units and channel blocks, as required by job conditions.
3. CMU that will remain exposed in the Work shall have a uniform texture and color.

2.02 MORTAR AND GROUT:

A. Portland cement: ASTM C150, Type II.

B. Lime: Hydrated, ASTM C 207, Type S.

C. Aggregates:

1. For mortar: ASTM C 144, natural sand.
2. For grout: Clean or washed gravel conforming to ASTM C 404. Modify coarse aggregate grading requirements so that not more than 5 percent passes a No. 8 sieve and 100 percent passes a 3/8-inch sieve.

D. Admixtures:

1. Admixture for grout: As selected by the Contractor but subject to the Architect's approval.
2. Use admixtures as recommended by their manufacturer. Secure manufacturer or distributor initial supervision by a qualified field representative to assure proper use of admixture.

E. Water: Potable and fresh

2.03 MIXES

A. Unless otherwise indicated, mix in proportions complying with CBC Table 21A-A (cement-lime) for Type N mortar, and Table 21A-B for grout.

1. Place 1/2 of water and 1/2 of sand in a mechanically-operated mortar mixer. Then add cement, lime, admixture and the remainder of sand and water.
2. Mix for at least 3 minutes after all ingredients are in the drum, but in no case less than required for a complete mix of the materials. Do not hand-mix ingredients.
3. Use admixtures in compliance with its manufacturer's printed instructions.
4. Empty the drum completely before the succeeding batch of materials is placed therein.
5. Adjust the consistency of grout so it will flow into place without segregation of ingredients. Water may be added to compensate for loss, but grout that has begun final set and becomes harsh shall not be used.

B. Retempering:

1. Mortar may be retempered with water as required to maintain high plasticity.
2. Retemper on mortarboards only by adding water within a basin formed by the mortar and reworking the mortar into the water.
3. Discard mortar and grout that are unused after 90 minutes from initial mixing time.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Verify foundation is clean, rough and level. Sandblast area under the masonry if the surface contains laitance or other foreign material, or is not sufficiently rough.

C. Verify foundation elevation is such that the bed joint thickness will be between 1/4 inch and 3/4-inch. The foundation edge shall be true to line so that the masonry does not project over more than 1/4-inch.

D. Verify that dowels are in proper location prior to start of masonry work. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION

A. Clean reinforcing free of loose rust, mill scale, earth and other materials that will reduce bond to mortar or grout.

B. Clean projecting dowels of loose scale, dirt, concrete or other material that will inhibit bond.

C. For bonding masonry to foundation, clean top of concrete foundation, remove laitance and expose aggregates before starting masonry construction.

D. Shores and centering: Design, erect, support, brace and maintain shoring and centering for temporary support of masonry elements.

1. Construct true to required shape, size and form, well braced and made rigid in all parts, and capable of supporting and sustaining the loads to which they are subjected.
2. Leave shores and centering in place until masonry can safely carry its own weight and the added loads of construction.
3. Brace CMU walls adequately to withstand all forces they will be subjected to during construction. Walls, other than free-standing earth retaining walls, are not designed to be self-supporting for lateral loads until attached to floor and roof elements.

3.03 INSTALLATION

A. Reinforcing: Place reinforcing accurately at spacing shown. Support and secure vertical bars against displacement. Place horizontal reinforcement as the masonry work progresses.

1. When foundation dowels do not line up with a vertical core, do not slope more than one unit horizontal in 6 units vertical. Grout dowels into a core in vertical alignment, even when in cells adjacent to the vertical wall reinforcing.
2. Embed reinforcing completely in grout with minimum coverage indicated below.

B. Concrete masonry units:

1. Layout CMU to minimize cutting and use of odd joint size or bond.

   a. Wherever possible, use full size units. Do not use fractional parts of units where whole units can be used.
   b. Do not use fragments of units.

2. Erect masonry plumb, square, straight and true to indicated lines, position and dimensions, in level courses with joints properly aligned.

   a. Use sound, dry, clean units. Do not use units with chips, cracks, voids, discolorations and other defects that may be visible or cause staining in the finished Work.
   b. Lay-up walls in straight uniform courses in regular running bond.
   c. Form corners with standard masonry bond by overlapping units.
   d. When moving a unit after it has been once set in place, remove the unit from the wall, clean of mortar and set in fresh mortar.

3. Cut CMU accurately to fit openings for other work. Cut and patch holes in CMU neatly and accurately.

   a. Saw cut CMU to conform to adjacent construction, to maintain uniform joint widths, and to maintain indicated joint pattern.
   b. Saw cut CMU to produce straight, sharp edges without spalling or other defects.
   c. Use deep-cut, U-shaped CMU to form bond beams, and special shapes for openings and offsets, and to maintain a proper bond throughout entire length of wall.

C. Joints: Make mortar joints straight, clean and uniform in width.

1. Lay starting joint on foundations with full mortar coverage on bed joint. Keep area where grout occurs free from mortar so that grout will contact the foundation.
2. Unless otherwise specified or detailed, make joints 3/8-inch thick with full mortar coverage on face shells and on the webs surrounding cells to be filled.
3. Regardless of jointing specified, all jointing in masonry exposed to the weather shall be tooled, making solid, smooth, watertight compact joints.

a. Perform tooling when mortar is partially set but still sufficiently plastic to bond. Use a tool that compacts the mortar, pressing excess mortar out of joint rather than dragging it out.
b. Tool joints that will remain exposed in the Work slightly concave to shed water.
c. Tool joints of masonry that will be concealed from view, covered by other materials, or that is scheduled to receive waterproofing membrane, flush with the face of the CMU.
d. Rake out joints that are defective at the time of tooling, re-point and then tool.

4. Butter vertical head joints well for a thickness equal to the face shell of the unit and shove these joints tightly so that the mortar bonds well to both units.
5. Set lintels, capping units and bearing plates in a full bed of mortar.
6. Do not wet CMU, except that in very dry weather the contact surfaces of the CMU shall be moistened immediately before laying.

D. Grouting:

1. Comply with CBC Section 2104A.6 and Table 21A-C.
2. Keep mortar droppings out of, or remove from the grout space before grouting. Fill all cells solid, unless otherwise indicated.
3. Vertical cells to be filled shall have vertical alignment to maintain a continuous unobstructed cell area.
4. Puddle grout and rod to encase steel and to ensure contact with masonry cells. Encase reinforcement in a minimum of 1/2-inch of grout between CMU and reinforcement.
5. Vibrate grout after initial absorption of water by the CMU, but before plasticity is lost.
6. Grout beams over opening in one continuous operation.
7. Grout bolts and anchors inserted in the wall solidly so that there is a minimum of 1-inch of grout between the bolt, the anchor and the masonry unit.

3.04 CURING

A. After walls are constructed, do not saturate with water for curing or any other purpose, except that when atmosphere is dry, dampen surfaces with a very light fog spray for 3 days.

3.05 HOLLOW METAL FRAMES

A. Locate frames accurately with head level, and jambs plumb and square.

B. Attach securely to floor and brace in position prior to start of masonry erection.

C. Frames are specified to be furnished with adjustable anchors. Adjust anchors to coincide with horizontal joints in masonry.

D. Fill frames solid with mortar or grout as erection progresses. Solidly grout space between hollow metal frames and masonry.

E. Provide temporary wood spreaders from jamb to jamb to ensure that jambs do not bow in or distort from straight line as frames are filled with mortar.

F. Provide temporary shores to support heads of metal frames and prevent deflection from superimposed loads during erection.

3.06 SITE TOLERANCES

A. Variation from plumb:

1. For surfaces of columns, walls, and arrises, do not exceed 1/4-inch in 10 feet, 1/2-inch in 20 feet nor 3/4-inch in 40 feet or more.
2. For external corners, expansion joints, control Joints, and other conspicuous lines, do not exceed 1/2-inch in 20 feet nor 3/4-inch in 40 feet or more.
3. For vertical alignment of head joints, do not exceed plus or minus 1/8-inch in 10 feet nor 1/4-inch maximum.

B. Variation from level:

1. Do not exceed 1/2-inch in 20 feet, nor 3/4-inch in 40 feet or more.
2. For top surface of bearing walls, do not exceed 1/8-inch in 10 feet, nor 1/16-inch within width of a single unit.

C. Variation of linear building line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2-inch in 20-foot nor 3/4-inch in 40-feet or more.

D. Variation in cross sectional dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/16-inch nor plus 1/8-inch

E. Variation in mortar joint thickness: All joints are assumed to be 3/8-inch nominal.

1. Do not vary bed joint by more than plus or minus 1/8-inch, with a maximum thickness limited to 3/8-inch.
2. Do not vary bed joint thickness from adjacent course bed joint thickness by more than 1/8-inch.
3. Do not vary head joint thickness by more than plus or minus 1/8-inch.
4. Do not vary head joint thickness from adjacent head joint thickness by more than 1/8-inch.
5. Do not vary from collar joint thickness by more than minus 1/16-inch or plus 1/8-inch.

3.07 FIELD QUALITY CONTROL

A. Site tests: The Owner may employ a testing agency to test questionable materials for compliance with specified requirements.

1. The Owner will pay test costs, except when testing discloses the masonry work tested does not comply with these Specifications.
2. In the event testing shows that the masonry work is deficient, re-install masonry work at no cost to the Owner.
3. Contractor shall pay for re-testing until the masonry installation demonstrates compliance with specified requirements.

B. Site tests and inspection: Inspection by a Registered Deputy Inspector (RDI) is required and will be provided by the Owner, unless noted otherwise on the Drawings.

C. Unless otherwise indicated, the following tests will be performed:

1. Provide masonry prism testing for masonry strength specified to be equal or greater than 2500 psi in accordance with CBC section 2105A.3.2 and 2105A.3.3.
2. For masonry strength specified to be less than 2500 psi, testing shall be of unit strength method in accordance with CBC section 2105A.3.4.
3. Mortar and grout shall be tested in accordance with UBC Standard 21-16 and 21-18 respectively.

3.08 CLEANING

A. Upon completion of installation, immediately clean all surfaces to remove grout scum and grout stains from CMU walls and all other surfaces.

B. Remove and replace components that are damaged, loose, chipped, broken, have been stained, corroded, or that do not match adjacent surfaces or cannot be satisfactorily cleaned or repaired, as determined and directed by the Architect, at no cost to the Owner. Stained units and units with chipped faces or edge damage will not be acceptable in exposed work.

C. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

END OF SECTION

SECTION 4828

STONE MASONRY

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide stone masonry, complete.

A. Work Included:

1. Submittals.
2. Granite Toilet Room countertops and splashes.
3. Granite finish on Lobby casework as indicated.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Obtain approval of all submittals prior to the production manufacture of stone items.

A. Product Data: Submit the following:

1. Submit the name and location of the proposed stone sources and/or quarries.
2. Manufacturer's technical literature and recommendations for stone cleaner proposed for use, including instructions.
3. Manufacturer's technical literature, printed directions, and use instructions for epoxy adhesive.

B. Shop Drawings: Submit for following items, plus such other as the Architect may require:

1. Toilet Room Countertop Stone -- detail each size and type of stone installation, coordinated to counter and casework Drawings and Shop Drawings.
2. Casework -- detail size and type of stone installation, including adhesive setting and dowels.

C. Samples: Submit Samples accordingly showing range in quality, color, texture, and finish that will occur. Label Samples with full identification. Prepare and submit Samples of all materials.

D. Site Samples: Erect following site Samples after approval of the above submittals:

1. Toilet Room countertop and splash stone, one complete unit of each type.
2. Lobby casework, start stone installation under observation of the Architect; produce a Sample of size adequate to show installation method and jointing. Approved Sample shall remain in place.

1.03 QUALITY ASSURANCE:

A. Qualifications of Manufacturer: Employ a stone manufacturer having not less than 5 years continuous operation in manufacturing stone materials of the required types. Submit Samples and data as the Owner may require.

B. Qualifications of Subcontractor: Stone manufacturer shall install Work of this Section, or the proposed Stone Subcontractor shall have not less than five years experience.

C. Stone Finish Quality: Stone surfaces showing "checker-boarding" (varying levels of sheen from stone panel to stone panel) and any stone surfaces showing "wheel" or fabrication marks other than required saw marks will be rejected and required replacements shall be provided by Contractor with no extra cost to Owner.

D. Supervision: Perform the Work of this Section under supervision of a capable specialist superintendent.

1.04 DELIVERY, STORAGE, AND HANDLING: Carefully load and pack stone for shipment, using special care to prevent damage in transit. Do not use any material that could cause discoloration or staining for blocking, packing, or strapping. At the site, store material under cover on protective pads or timbers.

1.05 PROJECT/SITE CONDITIONS: Prior to preparation of Shop Drawings, verify at the site the actual dimensions of each surface or area to receive stone.

1.06 WARRANTY: Conform to Section 01790. Warranty all Work of this Section against defects in materials, workmanship, and/or installation for 10 years.

PART 2 - PRODUCTS

2.01 STONE AND RELATED MATERIALS: Provide granite materials from the manufacturer and of the colors and appearances as specified on the Drawings. materials conforming to approved submittals, the Drawings, and as specified, including the sizes, thicknesses, and finishes, all matching approved Samples and approved site Samples.

A. Stone Types: Provide granites as supplied by the manufacturer specified, of the types and colors noted on the Drawings, matching approved Samples in Architect's office and on the Project Material Board available at the Project site, polished finish on all exposed granite surfaces. All granite shall be not less than 3/4" thick and thicker where indicated.

B. Spacers: Polyvinyl chloride strips, stainless steel, or equivalent, not subject to damage by water or alkali in mortar or grout.

C. Dowels: Cut from minimum 3/16" size stainless steel rods, lengths to embed at least 3/8" into granite and 5/8" into casework wood supports for stone.

D. Epoxy Adhesive: For all stone countertops, type supplied or recommended by stone manufacturer for bedding and securing stone pieces.

E. Epoxy Joint Grout: For joints in stone countertops and splashes, color as selected and approved, fully waterproof type, as supplied or recommended by stone manufacturer.

F. Latex Joint Grout: Provide for joints in granite on Lobby casework. Color the joint grout with mineral oxide pigment to produce a dry color closely matching approved Samples; include latex admix in proportion to portland cement as recommended by the admix manufacturer. Joint grout shall be unsanded for joints up to 1/8" wide. For joints over 1/8" to 1/4" wide, joint sand shall be added but sand volume shall not exceed portland cement volume. Where joint width exceeds 1/4", joint sand volume may be added up to 1-1/2 times the portland cement volume provided color of the cured dry grout is not adversely affected. The Contractor may provide factory-mixed ready to use grouts of the required colors equivalent to Laticrete 1600 Series Tri-Poly Fortified Unsanded Grout and Laticrete 1500 Series Tri-Poly Fortified Sanded Grout.

G. Stone Cleaner: As manufactured by HMK, distributed by the Architectural Products Group, phone 213/657-4118, the Hillyard Chemical Co. distributed by Best Maintenance, Los Angeles, Calif., 213/888-2988, Miracle Sealants & Abrasives Co., cleaner of the correct type for the stone. Sealer is not required on granite.

PART 3 - EXECUTION

3.01 TOILET ROOM COUNTERTOPS: Secure tops and splashes with concealed dowels placed near the corners of each stone piece, and suitable epoxy adhesive. Finish the joints about 1/16" wide and fill solid with epoxy joint grout of approved color, tooled dense and smooth.

3.02 LOBBY CASEWORK: Secure stone pieces with concealed dowels placed near corners of each stone piece, and embed stone in suitable epoxy adhesive. Finish the joints about 1/16" wide and fill solid with latex joint grout of approved color, tooled dense and smooth.

3.03 CLEANING AND SEALING: Conform to Section 01740. Clean all stone with cleaner, rinse, and dry.

3.05 PROTECTION: Cover and protect installed stone with non-staining heavy laminated building paper or rubber or plastic runners manufactured for the purpose. Maintain protection until no longer needed.

END OF SECTION

SECTION 05065

WELDED SHEAR STUD CONNECTORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Welded shear stud connectors.
2. Welding equipment for attachment of steel studs.

B. Related work:

1. Division 5 for structural steel deck.

1.02 SYSTEM DESCRIPTION

A. Provide steel shear studs for welding by automatically timed shear stud-welding equipment, 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.

1.03 SUBMITTALS

A. Data: Submit shear stud manufacturer's product data, specifications, typical installation details and other data as necessary to demonstrate compliance with the specified requirements.

B. Samples: Submit full-size shear stud sample when requested by the Structural Engineer.

C. Test reports:

1. Submit current compliance report from International Code Council (ICC) Evaluation Services showing shear studs comply with the Drawings, Specifications and the requirements of the authorities having jurisdiction.
2. Provide adequate test results to verify feasibility of through-deck welding for the particular connector sizes and deck thickness involved.

D. Manufacturer's instructions: Submit manufacturer-prepared instructions concerning the proper surface preparation and installation shear studs.

1.04 QUALITY ASSURANCE

A. Welder's qualifications: Qualify welding operators and welding procedures in compliance with AWS "Qualification" requirements of AWS D1.1.

1. Verify welders to be employed in this work have satisfactorily passed AWS qualification tests and are current in their certification.
2. If re-certification is required, retesting will be Contractor's responsibility.

1.05 HANDLING

A. Delivery: Deliver materials to project site in original unopened packages, clearly labeled with manufacturer's identification labels intact and legible, indicating manufacturer's name, brand, type and source of product.

B. Storage: Store materials above ground and under cover.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of design is for "SL3" shear connectors fabricated by Nelson Stud Welding, Inc. Other acceptable materials/manufacturers include the following:

1. "SC" shear connection studs by Stud Welding Associates.

2. "Tru-Weld" shear connection studs by TFP Corporation.
3. Or equal.

2.02 MATERIALS

A. Steel: ASTM A 108, Grade C-1020 cold-drawn steel. Studs shall conform to the following minimum physical properties:

1. Tensile strength: 65,000 psi.
2. Yield strength: 51,000 psi.
3. Elongation in 2 inches: 20 percent.
4. Reduction of area: 50 percent.

B. Provide shear 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.

1. Shear studs shall be finished by cold-heading, cold-rolling or machining.
2. Shear studs shall not be painted, galvanized, or cadmium-plated prior to welding.

2.03 WELDING EQUIPMENT

A. Furnish shear stud manufacturer-approved, automatically timed stud-welding equipment with a suitable power source.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine adjacent construction and supports.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION

A. Surfaces to receive shear studs shall be free from oil, grease, waxy films, paint and other deleterious materials that would negatively affect the quality of installation, durability and performance of components.

B. Promptly install shear studs after surface cleaning and preparation.

3.03 INSTALLATION

A. Do not install shear studs that exhibit defects, rusting, rust pits, scale, oil, deleterious or other substances that will interfere with their intended function.

B. Comply with shear stud manufacturer's instructions and the following.

1. Do not install studs on wet surfaces.
2. Break and remove arc shield after welding.

C. Shear stud lengths:

1. Shear stud lengths indicated are minimum net lengths after welding.
2. If reduction in length of a stud as it is welded results in the length of the stud being more than 1/16-inch greater than length specified by stud manufacturer, discontinue installation until cause is determined and eliminated, and pre-production testing is satisfactorily repeated.

D. Defective fillets: Shear studs not showing 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 using low-hydrogen electrodes.

3.04 INSTALLATION THROUGH STEEL DECK

A. Exercise caution to prevent defective welds or damage when welding through steel decking.

B. When shear studs will be welded through steel deck or corrugated steel forming, top flange of beams to receive such studs shall be unpainted and free of debris prior to installation of the deck or forming.

1. Install deck or forming so that the bottom rib or plate is in continuous contact with the surface to receive the studs.
2. Field-weld studs to structural members only after all steel framing, deck or forms are in place and shored where required.

C. Weld shear connectors to supports through decking in compliance with shear connector manufacturer's instructions and AWS D1.1.

1. Weld only on clean dry deck surfaces.
2. Use through-deck stud welding where deck material thickness permits proper weld fusion to develop required connector capacity.
3. If through-deck stud welding is not feasible, install studs through pre-punched holes in the deck. Provide pre-punched holes only for the studs involved and keep hole oversize to the minimum required to develop a proper weld.
4. Do not weld studs through 2 layers of deck heavier than 20-gage. Puddle welds (arc-spot) may be omitted where they coincide with studs.

3.05 SITE TOLERANCES

A. Longitudinal and lateral spacing for shear stud connectors relative 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 inches O.C.

B. Provide a minimum distance between edges of shear stud bases and member flange edges equal to the stud diameter plus 1/8-inch but minimum 1-1/2 in. clearance where possible.

C. Location accuracy of other types of studs shall permit the assembly of attachments without alterations or reaming.

3.06 REPLACING DEFECTIVE STUDS

A. Where a defective stud is removed, repair steel surfaces as follows:

1. Where stud is removed, make areas flush and smooth.
2. Complete repairs before installing replacement stud in defective area.

B. Areas subject to tensile stress:

1. If base metal material is pulled-out by shear stud removal, fill pocket by shielded metal-arc welding using low-hydrogen electrodes in compliance with AWS D1.1
2. Grind the weld surfaces flush and smooth.

C. Areas subject to compression:

1. Where a shear stud failure is confined to the shanks or fusion zones of the stud, a new shear stud may be installed adjacent to the defective area, subject to the Structural Engineer's approval, in lieu of repairing the defective area and installing a replacement stud.
2. If base metal material is pulled out by shear stud removal, fill pocket as specified above for tensile areas, except that if defect depth is not more than the lesser of either 1/8-inch or 7 percent of the base metal thickness, the defect may be faired by grinding in lieu of weld filling.

3.07 FIELD QUALITY CONTROL

A. Site tests: The Owner will employ a testing agency to test installed shear studs for compliance with specified requirements.

1. Perform pre-production testing, and stud installation and production testing under continuous inspection by the Owner's testing agency.
2. In addition to the standard reports, testing agency 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, at the start of any new welding procedure, and after any change in

welding procedure. Production period is defined as the time interval from start-up to any shutdown of any stud-welding equipment.

1. Shear stud connector test: After cooling, test first 2 shear studs on a member by hammer bending to a 45-degree angle.

    a. If failure occurs in the weld zone of either shear stud, correct welding procedure, weld and bend test 2 more studs on the member.
    b. If either of the second 2 shear studs fail, continue additional welding on separate materials until 2 consecutive studs are tested and found satisfactory before any more studs are welded to the member.

2. Studs other than shear connectors: Weld 2 studs to separate material in the same general position (flat, vertical, sloping or overhead) and similar steel material and thickness as members to receive studs.

    a. After cooling, hammer-bend the studs to a 30-degree angle.
    b. 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. Stud installation and production testing: After cooling, test at least one stud on each member by hammer bending to a 15-degree angle.

1. If failure occurs either in the weld zone or stud shank, follow method of correction required above for pre-production testing until successful installations are produced. Replaced defective studs.
2. Test all studs not showing a full 360-degree fillet weld, all replacement studs, any stud for which reduction in length is less than correct and any stud that has been repaired

    a. After cooling, hammer-bend studs to a 15-degree angle.
    b. For studs showing less than a 360-degree fillet weld, bend stud in the direction opposite to the missing weld fillet.

D. Inspection of studs other than shear connectors: Test at least one stud per 100 studs installed by hammer bending to a 15-degree angle

1. If stud fails, correct the welding procedure as required above for pre-production testing and bend-test 2 more in-place studs.
2. If either of the second 2 studs fail, all studs represented by the tests shall be bent-tested, or shall be rejected and replaced.
3. The Structural Engineer shall designate the extent of additional inspection and testing for critical structural connections.

E. Remove and replace studs that crack in the weld zone, in the base metal or the shank either during inspection and testing or under subsequent straightening.

F. Straightening: Provided no portion of the stud will fall within one-inch of an exposed concrete surface, bent shear stud connectors and shear transfer devices that are less than 16 degrees from vertical and are free of failure may be left in the bent position.

1. Perform stud bending and straightening without heating and before completion of each day's stud welding.
2. Obtain inspection and approval of straightened studs before covering.

G. Load testing: Testing agency shall load test studs in the extent and by methods directed.

3.08 CLEANUP

A. Leave areas around job site free of debris, welding materials, equipment and related items after completion of job.

END OF SECTION

SECTION 05080

PLANT-APPLIED METAL COATINGS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. This Section specifies the technical requirements for plant-applied fluoropolymer paint finish, and forms a part of all other Sections which require materials to be finished in accordance with this Section.

1.02 REFERENCES: Conform Work of this Section to the reference standards and specifications of the issues listed below (refer to Section 01420 if issue date is not listed), to the requirements indicated and specified, to required fire ratings, and to pertaining regulatory requirements of authorities having jurisdiction. The specifications, codes, publications, and standards listed but referred to hereafter by the basic designation only form a part of this Section to the extent referenced herein:

A. American Society for Testing and Materials (ASTM):

D2244-93(2000).....Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit the manufacturer's Product Data covering all paint materials, surface preparation, pretreatment or priming, application, handling, and repair and touch-up instructions.

B. Master Samples: Submit two sets of four identical Samples for each paint finish. Prepare one set of Samples on 12" squares of flat metal and another set on tubular metal sections at least 18" long and of profile type and size typical of the members required for involved Work. Submit as many sets of Master Samples as are required for approval.

C. Samples Required Under Other Sections: Samples of fluoropolymer paint finish required to be submitted for the Work under other Sections shall demonstrate an exact match with the approved Master Samples in all characteristics.

D. Other Samples: Submit such other Samples as the Architect may request.

E. Certificates: Submit certificates stating that paint system applicator(s) is/are currently licensed by the paint manufacturer. For each delivery of paint finished products to the site, submit paint applicator's certificate stating delivered products have been painted in accordance with this Section.

1.04 QUALITY ASSURANCE: Use the paint products of one manufacturer to produce uniform quality, color, and finished appearance. Applicator(s) of the fluoropolymer paint finishes shall be licensed by the fluoropolymer paint manufacturer.

A. Quality Control: The Architect will return two flat metal panels and two tubular section Samples from each set of approved Master Samples to Contractor for production quality control.

B. Color: Required colors are as specified on the Drawings. Manufacturer's standard color(s) may be used if acceptably matching indicated or designated colors, as determined by the Architect. Custom colors are intended.

1.05 DELIVERY, STORAGE, AND HANDLING: Ship, store, and handle painted items and products by methods that prevent deterioration or damage, and conform to the protection and packing requirements herein.

1.06 WARRANTY: Conform to Section 01790. Furnish to the Owner a written warranty for 20 years covering fluoropolymer paint finish against defects in material or application, including chalking, loosening, peeling, pitting, or color changes exceeding 5 NBS units determined according to ASTM D2244 during the warranty period.

PART 2 - PRODUCTS

2.01 FLUOROPOLYMER PAINT: Factory mixed by a licensee of Atochem North America with the paint formula containing not less than a 70% resin content of Kynar 500 polyvinylidene fluoride (PVF_2) "Duranar XL" by PPG Industries Inc., Coatings and Resins Group. Refer to Section 01630 regarding proposed substitutions.

A. Primer: Manufactured for the approved paint system and furnished by the approved fluoropolymer paint manufacturer, baking type epoxy primer for all metal surfaces; a high-build urethane primer may be used if a standard part of the paint manufacturer's system.

B. Touch-Up Paint: Air-drying exterior quality fluoropolymer enamel based on Kynar ADS, furnished by the same fluoropolymer finish paint manufacturer, color, gloss, and appearance to exactly match the fluoropolymer paint finish, including the same UV barrier coat, color coat, and a clear top coat as required to match and equal the adjoining paint finish.

C. Paint System: Four coats per system as follows, mil thicknesses of cured dry films which are the minimum acceptable mil thicknesses:

1. Aluminum:	1st Coat	-	Epoxy Primer	0.20 mils.
	2nd Coat	-	Duranar UV Barrier Coat	0.75 mils.
	3rd Coat	-	Duranar Color Coat	0.75 mils.
	4th Coat	-	Clear Duranar Top Coat	0.50 mils.

2. Coated Metal Surfaces: On zinc or cadmium coated surfaces, apply same paint system as specified above for aluminum.

2.02 PREPARATION FOR PAINTING: Clean, degrease, and prepare surfaces top be coated according to the paint manufacturer's instructions, using methods that do not damage materials or leave any deleterious residues. Comply with Aluminum Association Spec AA-C12 for aluminum, when applicable. Buff and polish all exposed metal surfaces to remove extrusion or fabrication marks which may show through the completed paint finish.

A. Pretreatment: After buffing is completed, aluminum surfaces may be given a fine matte caustic etch pretreatment and rinse if standard with the aluminum product manufacturer.

B. Chromate Conversion Preparation of Aluminum: For all aluminum items, use a 5-stage process that adds 20 to 40 mg/sf of chromate film to the aluminum surfaces including chemical metal cleaning at minimum 120°F, clear water rinse, chromate conversion treatment at minimum 100°F, a clear water rinse, and a final sealing rinse.

C. Preparation of Other Metals: Clean zinc or cadmium coated metal surfaces of grease, oil, and all other deleterious substances.

2.03 PAINT APPLICATION: Apply entire painting systems under dust-free temperature and humidity controlled paint booth conditions and thermally bake each coat at the temperature and for the duration directed by paint manufacturer. Electrostatic spray application is preferred unless the surfaces are coil coated. Use method that minimizes handling both during and after paint application.

A. Priming: Apply the required primer on all exposed and concealed surfaces, except the interior of tubular members. Exposed surfaces include interior surfaces of channel-shaped glazing stops, glazing rebates, and like accessible or visible surfaces.

B. Finish Paint: Apply on all exposed surfaces and extend over concealed surfaces for a distance sufficient to assure complete continuity of the coatings without visible skips, holidays, or thin edges, and so the edges of finish paint are fully concealed by calking sealant, glass setting materials, abutting finish materials or finish items, and like items. Fully coat surfaces visible through glass edges. Paint thickness on corners and edges shall equal that on the flat surfaces.

C. Direction Marking: For the surfaces painted by roller process, mark concealed surfaces to indicate the direction of roll coating so that fabricated materials will not exhibit color change resulting from the roller coating process. Mark spray painted materials in the same manner as necessary to assure same results. Apply all markings on surfaces concealed in the finished Work.

D. Heat Sensitive Materials: Apply specially formulated slow hardening low baking temperature type primer and fluoropolymer paint finish coat based on Kynar SL and furnished by same fluoropolymer paint manufacturer, and of color, gloss, and appearance to exactly match approved fluoropolymer paint finish. Apply on materials that are damaged by the normal high baking temperatures. Carefully control the heat during paint baking operations to prevent damaging or distorting heat sensitive materials.

2.04 PACKING AND SHIPPING PROTECTION: Do not handle the painted products until paint finish is fully cured and hardened.

A. Primary Protection: Cover painted surfaces with compatible strippable pressure-sensitive covering material of type that does not leave adhesive on the surface when removed, or enclose painted items with a polyethylene film wrapping secured with tape bands.

B. Packing: Secure bundled items with resilient separators, pads, and bands or tape, non-staining types that prevent chafing, gouging, excessive pressure at any point, or other damage. Ship the items in water-resistant sealed containers labeled as to contents and locations unless installed immediately.

PART 3 - EXECUTION

3.01 INSTALLATION OF FINISHED PRODUCTS: Wherever possible, leave primary protection in place until just prior to final cleaning, removing only those parts required for connections. Where the painted products are jambs or heads of openings used for the passage of materials or debris, install temporary boarding or flashing necessary to protect the painted surfaces. Immediately remove damaged Work that cannot be satisfactorily repaired and provide acceptable Work at no extra cost to the Owner.

3.02 TOUCH-UP AND REPAIR: Subject to Architect's prior approval in each case, minor scratches and blemishes in the finish may be repaired with touch-up paint; smooth defect edges and use air-brush and hot-air-gun technique, or equivalent. Produce virtually non-apparent repairs. If the repairs are not acceptable, remove and replace involved Work as directed and as specified above for damaged Work.

3.03 FINAL CLEANING: Conform to Section 01740. Just prior to completing the entire Work, remove protection and clean all painted surfaces. Use non-abrasive cleaning agents only, recommended by and satisfactory to the paint manufacturer.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Extent of structural steel work shown on Drawings including schedules, notes and details for size and location of members, typical connections, and type of steel required or required to complete Work.

B. Extent of structural steel work (HSS sections, angles, plates, etc.) as required for back-up support framing of exterior curtain wall to be designed and detailed as specified in related sections.

C. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

D. Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site without causing delay in the work.

1. Promptly notify Owner's Representative whenever design of members and connections for any portion of structure are not clearly indicated. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

E. Related Sections:

1. Division-3, Non-Shrink Grout.
2. Division-5, Cold Formed Metal Framing.
3. Division-5, Metal Deck.

1.02 REFERENCES

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. Chapter 22, California Building Code and City of Los Angeles.
2. AISC Manual of Steel Construction (LRFD), Third Edition, Volume I.
3. AISC Load and Resistance Factor Design Specification for Structural Steel Buildings (1999), including "Commentary" and Supplement 1 (2001),
4. AISC Code of Standard Practice for Steel Buildings and Bridges (2000) except that Section 4, Paragraph 4.4.1(b) is deleted. Substitute the following: "Connections submitted in accordance with Section 3.1.2 shall be designed by a California Registered Professional Engineer employed by the fabricator, unless such connections are specifically designed in the Contract Documents. Submit all connection calculations for review." Omit reference to Owner responsibility in AISC Code "Commentary" paragraph 4.4.1, relative to responsibility for connections.
5. AISC "Specifications for Architecturally Exposed Structural Steel."
6. AWS D1.1 Structural Welding Code, 2002 Edition.
7. LRFD Specifications for Structural Joints Using ASTM A325 or A490 Bolts approved by Research Council on Structural Connections of the Engineering Foundation (2000).
8. AISC Seismic Provisions for Structural Steel Buildings (1997), including Supplement No. 2 (2000).
9. FEMA 350, "Recommended Seismic Design Criteria for New Steel Moment-Frame Buildings (2000).
10. FEMA 353, "Recommended Specifications and Quality Assurance Guidelines for Steel Moment-Frame Construction for Seismic Applications (2000).

1.03 SUBMITTALS

A. Product Data: Submit for information producer's or manufacturer's specifications and installation instructions for following products. Include laboratory tests reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. High-strength bolts (each type), including nuts and washers.
3. Structural steel primer paint.
4. Shrinkage-resistant grout.

B. Shop Drawings: Submit for action detailed, coordinated and checked shop drawings for all structural steel prior to the start of fabrication and/or erection. Shop drawings shall show:

1. Size and location of all structural members and connection material
2. Complete information necessary for the fabrication of members including cuts, copes, holes, doubler plates, stiffeners, and camber.
3. Type, size and location of bolts and welds.
4. Surface preparation and finishes.
5. Details of assembly.
6. Identification of shop-installed high-strength bolted connections as snug-tight, pretensioned or slip-critical, as required by the Contract Documents.
7. Identification of Welding Procedure Specification (WPS) applicable to each weld.
8. Furnish setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of others sections.
9. Shop drawings for the built-up steel girders or other structural members requiring penetrations shall contain a statement confirming that the Contractor has coordinated the location and size of all of the openings.
10. Shop drawings stamped and signed by California licensed Professional (Civil) Engineer for all back-up support steel framing (HSS sections, angles, plates, etc.) as required for exterior curtain wall system to be designed and detailed as specified in Section 05400, Cold-Formed Metal Framing.

C. Erection Drawings: Submit for action detailed, coordinated and checked erection drawings for all structural steel for review prior to the start of fabrication and/or erection. Erection drawings shall be submitted that show:

1. Location of all structural material.
2. Identification mark of members.
3. Orientation and relation of members to appropriate grid lines.
4. Setting elevations for column bases.
5. Standard and special details for bolted and welded field connections.
6. Identification of field-installed high strength bolted connections as snug-tight, pretensioned or slip-critical, required by the Contract Documents.
7. Identification of WPS applicable to each weld.

D. Test Reports: Submit for information copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) conducted and test results. State compliance or non-compliance with specifications.

E. Welding Procedure Specifications and Welding Procedure Qualifications:

1. Submit for action Welding Procedure Specifications (WPS) for each weld to be used on the project. Only WPS's referenced on the shop drawings shall be submitted. Submittals consisting of additional WPS's not specifically referenced on the shop drawings will be rejected. The Contractor shall also submit the manufacturer's product data sheets for all welding material to be used. The data sheets shall describe the product, limitations of use, recommended welding parameters, and storage and exposure requirements, including baking and rebaking, if applicable.
2. Welding Procedure Specifications (WPSs) shall be categorized by and specify the following items:

    a. Steel specification(s) and grade(s) to be welded
    b. Thickness range of material to be joined
    c. Type of joint
    d. Type of weld (groove, fillet, plug, slot)
    e. Size of weld
    f. Position of welding

3. Based upon the application, the WPS shall specify, as a minimum, the following items, as applicable for the welding process:

F. Power supply (constant current or constant voltage)

G. Welding electrode, flux, and shielding gas classifications

H. Welding electrode and flux manufacturer and trade name

I. Electrode diameter

J. Voltage (except SMAW)

K. Current (amperage) or wire feed speed

L. Electrical stick-out or contact tube-to-work distance (wire fed)

M. Travel speed

N. Minimum preheat and interpass temperatures

O. Maximum preheat and interpass temperatures (if applicable)

P. Number and placement of passes

Q. Technique (stringer or weave bead)

R. Shielding gas flow rate

S. For groove welds, the joint configuration and tolerances

T. Other pertinent information specific to the weld to be made.

1. Tolerances applicable to the various welding parameters shall also be noted in the WPS.
2. Submit for action Welding Procedure Qualifications when proposed welds are not defined as prequalified by AWS D1.1.

U. Welding Performance Qualification Records (WPQRs): The Contractor shall submit written Welding Performance Qualification Records (WPQRs) for all welding personnel under the Contractor's supervision that will be performing services on the project. The WPQR shall document the successful completion of the appropriate welding personnel qualification test. All welder qualification testing shall be performed in accordance with the current or a previous version of AWS D1.1. The Contractor shall also submit additional documentation that the welder has passed all designated supplemental welder qualification testing required for the types of welding to be performed.

V. Contractor's Statement of Responsibility: Each Contractor responsible for the work shall submit a written Statement of Responsibility prior to commencement of the work. The statement shall contain the following:

1. Acknowledgement of awareness of the special requirements contained in the Quality Assurance, Quality Control and the Submittals Sections of this Specification.
2. Acknowledgement that control will be exercised to obtain conformance with the construction documents.
3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting, and the distribution of reports.
4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts, templates, and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. 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 approved.

1.05 QUALITY ASSURANCE AND QUALITY CONTROL

A. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components that do not comply.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society "Structural Welding Code," AWS D1.1 and "Standard Qualification Procedure.

C. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

1. If recertification of welders is required, retesting will be Contractor's responsibility.

D. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

E. Owner will select an independent testing and inspection agency to perform the inspections and tests listed in Division-1, Quality Assurance & Control; to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

F. Testing Agency: Conduct and interpret tests, and state in written reports whether test specimens comply with requirements, and specifically state any deviations therefrom.

G. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

H. Testing agency may inspect structural steel at plant before shipment; however, Owner's Representative reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

I. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

J. Testing Agency will inspect and test as follows and as specified on the Drawings. Refer to FEMA 353, Tables 6-1 and 6-2 for requirements for Process and Visual Welding Inspection Categories and requirements. Refer to FEMA 353 Table 6-3 for Nondestructive Testing Requirements in addition to inspection or Nondestructive Testing Requirements indicated herewithin.

1. Inspector Certifications: The following requirements shall apply to welding inspections performed for the project:

a. The lead welding inspector shall be a Certified Welding Inspector (CWI) per AWS-QC1 Standards, shall be approved by the Structural Observer and certified by the Building Official as a registered deputy inspector for structural steel welding (ICBO Certification) and shall possess a minimum level of UT Level II Certification. Other welding inspectors performing visual inspection under the supervision of the lead welding inspector shall possess ICBO Certification, and persons performing non-destructive testing shall possess UT Level II Certification. Not more than four non-CWI inspectors shall be under the supervision of a CWI inspector.

2. Shop Bolted Connections: Inspect in accordance with AISC Specifications for Structural Joints, Section 9 "Inspection."

3. Shop Welding: Inspect and test during fabrication of structural steel assemblies for each Process and Visual Welding Inspection Category, as follows:

a. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work and record rejectable weld defect rates greater than three percent for any given welder to the Owner's representative. Record work required and performed to correct deficiencies.

b. Perform Visual Inspection of all welds and confirm use of proper WPS for each weld. Welds executed not in conformance with WPS shall be considered rejectable (AWS D1.1 Section 6.3.1).
c. Perform Tests of welds as follows:

1) Liquid Penetrant Inspection(PT): ASTM E165.
2) Magnetic Particle Inspection (MT): ASTM E109, performed on

a) 100% of all SFRS complete penetration welds
b) Root pass at SFRS complete penetration welds (beam/column joint and column base)
c) 100% of all SFRS partial penetration and fillets welds at beam to column connection.
d) 25% of all SFRS partial penetration and fillet welds
e) Finished weld of 10% of all fillet welds at random.

3) Radiographic Inspection: ASTM E94 and ASTM E142, minimum quality level "2-2T."
4) Ultrasonic Inspection (UT): ASTM E164 for

a) 100% all complete penetration welds
b) 10% at random of all partial penetration column splices.
c) Perform a UT lamination check of the column cracks or zones of incomplete fusion or penetration for any welds are not acceptable.

4. Field Bolted Connections: Inspect in accordance with AISC Specification. Observe installation of all bolts and confirm proper use and compression of load indicator washers at all slip critical bolts.
5. Field Welding: Inspect and test during erection of structural steel as follows:

a. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work and record rejectable weld defect rates greater than three percent for any given welder to the Owner's Representative. Record work required and performed to correct deficiencies.
b. Perform continuous, visual inspection of each and all welds during the welding work and confirm use of proper WPS. Welds executed not in conformance with WPS shall be considered rejectable (AWS D1.1 Section 6.3.1).
c. Perform tests of each and all welds as follows:

1) Liquid Penetrant Inspection (PT): ASTM E165.
2) Magnetic Particle Inspection (MT): ASTM E109, performed on

a) 100% of all SFRS complete penetration welds
b) Root pass at SFRS complete penetration welds (beam/column joint and column base)
c) 100% of all SFRS partial penetration and fillets welds at beam to column connection.
d) 25% of all SFRS partial penetration and fillet welds
e) Finished weld of 10% of all fillet welds at random.

3) Radiographic Inspection: ASTM E94 and ASTM E142, minimum quality level "2-2T."
4) Ultrasonic Inspection (UT): ASTM E164 for

a) 100% all complete penetration welds
b) 10% at random of all partial penetration column splices.
c) Perform a UT lamination check of the column.
d) Twenty-five percent of all complete joint penetration welds in the SFRS as defined in Section 1.7, shall be reinspected not earlier than 48 hours after the weld is completed.

5) Cracks or zones of incomplete fusion or penetration for any welds are not acceptable.

1.06 PRE-FABRICATION / PRE-ERECTION CONFERENCES

A. Prior to performing any fabrication or erection work, the Owner's Representative, Quality Assurance Personnel, Inspectors, and Contractor personnel supervising shop, field and Quality Control work shall hold a Pre-Fabrication and Pre-Erection Conference to review welding procedures, and inspection requirements for all welding and bolting operations.

1.07 SEISMIC-FORCE RESISTING SYSTEM

A. The Seismic-Force-Resisting System (SFRS) is defined as the assembly of structural elements in the building that resists seismic forces. Included in the SFRS are the columns, beams, girders and braces, and the connections between these elements, specifically designed to resist seismic forces, as designated on the contract documents. The SFRS does not include members that provide out-of-plane bracing to components of the SFRS, nor does it include other structural members designed to resist only gravity loads.

B. All details referenced as applying to members of the SRFS shall be considered part of the SRFS.

1.08 EXTRA MATERIAL

A. Furnish and install 1% tonnage amount of structural steel in addition to quantities shown on drawings, as required by details shown on the drawings, or as required by referenced codes and standards. This additional steel shall be installed during construction, in sizes and locations as directed and is to be used for miscellaneous framing including slab opening support, mechanical supports, bracing elements, etc.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For fabrications of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding and repair as specified in AWS D1.1, prior to cleaning, treating and application of surface finishes.

B. Structural Steel Shapes, Plates and Bars: ASTM A36, ASTM A572 Grade 50, ASTM A992 as indicated on the Drawings.

1. Finish: Shop primed except where indicated to be galvanized or to be left unpainted.

C. Cold-Formed Steel Tubing: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53, Type E or S, Grade B.

1. Finish: Shop primed except where indicated to be galvanized or to be left unpainted.

E. Head Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications and AWS D1.1, Sections 7.2 and 7.3. Heat-type steel studs, with machined, chamfered ends, "Power Point" as manufactured by KSM-Div. - Omark Industries, or Nelson Div. – TRW or equal; size as indicated.

F. Anchor Bolts: ASTM A449, nonheaded type unless otherwise indicated.

G. Provide hexagonal nuts for all connections.

H. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts, only where indicated.

1. Provide hexagonal heads and nuts for all connections.

I. High Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.
2. Quenched and tempered steel bolts, nuts and washers, complying with ASTM A490.

3. Direct tension indicator washer-type bolts per ASTM F959, or twist-off-type tension control bolts per ASTM F1852 shall be used at all slip critical bolts.

J. Electrodes for Welding: Welding materials shall comply with AWS A5.1, A5.5, A5.17, A5.18, A5.20, A5.23, A5.25, A5.26, A5.28, A5.29, and A5.33.

1. For welded joints on members comprising the Seismic Force Resisting System, welding filler metals shall be classified for nominal 70 ksi tensile strength, referred to as E70 electrodes, regardless of welding process, and shall provide the following minimum mechanical property requirements:

   a. CVN toughness of 20 ft-lbs at -20°F using AWS A5 classification test method.
   b. CVN toughness of 40 ft-lbs. at 70°F using test procedure prescribed in Part I: Appendix A of FEMA 353.
   c. Yield strength: 58 ksi minimum using both AWS A5 classification test for E70 classification tests and the test procedures prescribed in Part I: Appendix A of FEMA 353.
   d. Tensile strength: 70 ksi minimum using both AWS A5 classification test for E70 classification tests and the test procedures prescribed in Part I: Appendix A of FEMA 353
   e. Elongation: 22 percent using both AWS A5 classification test and the test procedures prescribed in Part I: Appendix A of FEMA 353

2. For welded joints on members comprising the Seismic Force Resisting System, welding filler metals, as supplied by the manufacturer, shall meet the requirements for H16 (16 ml diffusible hydrogen per 100 grams deposited weld metal) as tested using the mercury or gas chromatograph method as specified in AWS A4.3. The manufacturer's Certificate of Conformance shall be considered adequate proof that the supplied electrodes meet this requirement, and no additional testing of filler metal samples or of production welds is required.
3. For all other welds, the filler metals shall be classified as low hydrogen under the provisions of AWS D1.1.

K. Structural Steel Primer Paint: Fabricator's standard rust-inhibiting primer. Rust-inhibiting, long oil alkyd, equal to Tnemec 10-99, ICI, or equal and formulated for exterior exposure for extended periods up to 1 year.

2.02 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel, which is partially exposed on exposed portions and initial 2" of embedded areas only.

1. Do not paint surfaces that are to be welded or high-strength bolted with friction-type connections.
2. Do not paint surfaces that are scheduled to receive sprayed-on fireproofing.
3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

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 Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning."
2. SP-2 "Hand Tool Cleaning."

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces. Apply two coats of paint to surfaces that are inaccessible after assembly or erection.

2.03 FABRICATION

A. Fabricate structural steel in accordance with the AISC Specifications with the modifications and additional requirements specified herein, as indicated on the Drawings, and as indicated on the shop drawings.

B. Substitutions of structural steel members, or modification of details, or both, shall not be made without the approval of Owner's Representative. Requests for substitutions or modifications of details

shall be accompanied by shop drawings indicating the dimensions and weight of both the original and substitute members, connections, the relationship or the substitute member, or modification of details, to adjacent work and calculations prepared by a California Registered Professional Engineer (Structural). Substitutions are not to affect the architectural design and shall be equal or greater than the original member in structural characteristics and performance, and at no additional cost to the Owner. Refer to the drawings for requirements related to substitution of moment frame connection details.

C. Shop Connections: Weld or bolt as indicated on the drawings or as otherwise required.

D. Bolt field connections except where welded connections are indicated. Use high-strength threaded fasteners for all bolted connections, except where unfinished bolts are indicated.

E. Install high strength threaded fasteners in accordance with AISC Specification for Structural Joints.

F. Procedures for Welding Method Employed, Appearance and Quality of Welds Made, and Methods Used in Correcting Welding Work: Conform to AWS D1.1.

G. Welded Construction

1. Each welder working on the project shall be assigned an identification symbol or mark. Each welder shall mark or stamp his or her identification symbol at each weldment completed. Stamps, if used, shall be the low-stress type.
2. Welding personnel shall be qualified in accordance with AWS D1.1, Section 4, Parts A and C. Welders who have not used the given welding process for a period of six or more months shall be requalified. Welders whose work routinely exhibits poor workmanship shall be requalified before performing further welding.
3. WPQR testing performed more than six months prior to the start of the welding by the welder is acceptable, provided written documentation is submitted showing that the welder has continued to use the applicable welding process on an ongoing basis since the test was conducted, with no lapse in service exceeding six months.
4. WPSs shall be available to welders and inspectors prior to and during the welding process. Prior to welding, joint fit-up shall be verified by the welder for conformance with the WPS and AWS d1.1.
5. For all CJP and PJP groove welds subjected to ultrasonic testing (UT), a visible mark shall be accurately placed on the steel a distance 4 inches away from the root of the edge preparation.
6. Welding shall be performed in accordance with the appropriate WPS for the joint.
7. Groove welds shall be complete joint penetration groove welds, unless specifically designated otherwise on the Drawings. Groove preparation details are at the Contractor's selection, subject to qualification, if required, in accordance with AWS D1.1.
8. Weld tabs shall be in accordance with AWS D1.1, Section 5.3.1 as modified herein. End dams shall not be used.
9. Backing bars shall be in accordance with AWS D1.1, Section 5.10.
10. Faces of fillet and groove welds exposed to view shall have as-welded surfaces that are reasonably smooth and uniform. No finishing or grinding shall be required, except where clearances or fit of other items may so necessitate.

H. Bolted Construction: Store fasteners in a protected place. Except for ASTM F1852 "twist-off" type assemblies, clean and relubricate bolts, nuts and washers that become dry or rusty before use. F1852 fastener components may be relubricated following the manufacturer's written instructions, and must be retested after relubrication and prior to use to verify suitability for installation.

1. Do not use flame cutting to align bolt holes except as permitted by RCSC specifications.
2. Ream holes that must be enlarged to admit bolts. Do not enlarge holes by more than 1/32 inch. Should additional reaming beyond 1/32 inch be necessary, drill or ream to the next larger hole size and use the next larger size bolt, with the Owner Representative's approval.
3. Bolt holes may be made by punching or drilling. Bolt holes may also be made by thermal cutting to a smaller diameter, followed by reaming to the required diameter.

I. Corrective Work: There shall be no field cutting or alteration of structural steel members or connections in the Seismic Force Resisting System without prior review by the Owner Representative. Structural elements having fabrication errors and/or which do not satisfy tolerance limits shall be repaired. Submit drawings showing reasons for and details of proposed corrective work for approval by the Owner Representative prior to performing corrective work. Corrective work shall be performed

in accordance with the requirements of the Contract Documents. Pre-approved repair and correction procedures may be used when authorized by the Owner Representative for specific conditions.

2.04 COLUMN BASES, BEARING PLATES & ANCHOR BOLTS

A. Furnish column base plates and leveling plates as noted in the Drawings.

B. Furnish anchor bolts and templates.

C. Furnish bearing plates under beams resting on footings, piers or walls.

D. Mill or press level column bases, bearing plates, and leveling plates as required. Furnish loose plates for setting, as specified in Division-3, Concrete.

2.05 STEEL WALL FRAMING

A. Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square and true members in completed wall framing.

2.06 HOLES FOR OTHER WORK

A. Provide holes where indicated or as required for securing other work performed by separate contractors to steel framing, and for the passage of such work through steel framing members, as shown on approved shop drawings.

B. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.

C. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.07 SUPPLEMENTAL WELDING REQUIREMENTS FOR SEISMIC FORCE RESISTING SYSTEM

A. Welding Personnel Qualification

1. Supplemental Welding Personnel Testing: Welders and welding operators performing work on welds identified on the Drawings shall pass supplemental Welder's Performance Test, as prescribed on the Drawings on special test joint mock-ups prior to performing welds for the Work. Testing shall be performed using the process to be used in the work, with the WPS set at the highest deposition rate to be used in the work. FCAW-S shall be considered a process separate from FCAW-G. Tack welders need not perform such Supplemental Testing.
2. Testing Agency shall verify that the required supplemental welding qualification tests have been passed and reported to the Owner's representative prior to performing any welds.

B. Intermix of Filler Metals: For welded joints requiring CVN toughness as specified for Seismic Force Resisting System, FCAW-S filler metals shall not be used in combination with filler metals for other processes, including FCAW-G, unless supplemental toughness testing prescribed in Appendix C of FEMA 353.

C. Maximum Preheat/Interpass Temperature: The maximum preheat and interpass temperature permitted is 550°F, measured at a distance of 1 inch from the start of the weld pass. The maximum temperature may not be increased by WPS, with or without qualification testing.

D. Non-Fusible Backing: The use of non-fusible backing materials, including ceramic and copper, is permitted only with satisfactory welder qualification testing performed using the type of backing proposed for use, using the test plate shown in AWS D1.1, Figure 4.2.1, except that groove dimensions shall be as provided in the WPS and PQR. Should the joint to be welded include welding a beam-flange-to-column flange through an access hole, the Supplementary Welder Qualification Test shall be performed using the type of backing proposed for use.

1. For non-fusible weld tabs and short segments of non-fusible backing bars used at the ends of welds between shear tabs and column faces, or at the ends of continuity plate welds, special welding personnel and welding procedure qualification testing is not required. The welder

shall be trained in the proper welding techniques for using such non-fusible weld tabs and backing bars prior to performing such welding on the project.

2.08 HEAVY STRUCTURAL SECTIONS

A. The following rolled sections and built-up sections shall be considered as Heavy Sections, subject to special notch toughness, fabrication, welding and inspection requirements as specified herein.

1. ASTM A6 Group 3 shapes with flanges thicker than 1-1/2 in.
2. ASTM A6 Group 4 and Group 5 shapes.
3. Welded or built-up members with web or flange plates exceeding 2 inches in thickness.

B. Where complete penetration welds occur at ASTM A6 Groups 4, 5 and plates exceeding 1-1/2 inches in thickness, certified laboratory test reports shall be submitted to the Structural Observer and upon request to the Building Official. The test reports shall certify that Charpy V-Notch testing was conducted in compliance with ASTM A6, Supplementary Requirement S5, including impact tests complying with ASTM A673 at frequency p with minimum average value of 20 ft-lbs absorbed energy at 70 degrees Fahrenheit. If certified laboratory test reports cannot be made available, the testing laboratory will perform tests as approved by the University Representative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Erect structural steel in accordance with the AISC Specifications and AISC Code of Standard Practice, with the modifications and additional requirements specified herein.

B. Surveys: Employ a registered professional engineer or land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Owner's Representative. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Owner's Representative.

C. Provide suitable and safe erecting equipment for workman. Maintain equipment in a safe and stable condition until the steel structure is fully self-supporting. Conform to the requirements governing safety and health regulations for construction equipment and construction safety.

3.02 ANCHOR BOLTS

A. Furnish anchor bolts, leveling plates and other connections between the structural steel and foundations for setting as specified in Division-3, Concrete. Provide templates with the anchor bolts as may be required to locate the anchor bolts and other connections accurately and correctly. Check and verify vertical and horizontal alignment of anchor bolts before setting of structural steel. If any errors are noted, make corrections.

3.03 FIELD ASSEMBLY

A. Accurately assemble structural steel framing to the lines and elevations indicated. Align and adjust the various members forming parts of a completed frame or structure before permanently fastening. Fasten splices of compression members after the abutting surfaces have been brought completely into contact. Clean bearing surfaces and surfaces that will be in permanent contact before the members are assembled.

B. Temporarily connect all members with sufficient bolts to ensure the safety of the structure until permanent connections are made. Provide all temporary guys, braces, etc., necessary to protect the framing against wind and construction loadings, and maintain the structure plumb and in proper alignment until such time as the work of other trades is in place and the structure is complete.

C. Level and plumb individual members of structure and the structure as a whole within specified AISC tolerances or as required to install finishes and equipment as detailed on the drawings, whichever is more stringent. Coordinate tolerances requirements prior to fabricating and erecting steel.

D. 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. If members do not fit properly in the field, drill necessary new holes as approved by the Owner's Representative.

F. Members that are warped or bent may be rejected if, in the opinion of Owner's Representative, they are unserviceable. Otherwise, correct bent or warped members to the satisfaction of Owner's Representative before being erected.

G. Splices will be permitted only where indicated. All erection bolts used in welded construction may be tightened securely and left in place; if erection bolts are removed, fill holes with plug welds.

H. Bracing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to filed welds as specified in the AISC Specifications.

I. Erect columns and attached base plates (using non-shrink grout installed under Division 3; verify grout pad levels and construction before proceeding with the work). Securely brace and guy columns and hold them plumb in line until bolting has been completed.

J. Erect columns and attach base plates or leveling plates. Securely brace and guy columns and hold them plumb and in line until bolting has been completed.

K. Tighten anchor bolts after supported members have been positioned and plumbed.

3.04 BACKING BARS

A. The use of backing bars shall be in accordance with AWS D1.1-98, Section 5.10. All tack welds attaching backing bars to the steel prior to the welding of the joint shall be made within the joint. Preheat for such tack welds as required by AWS D1.1, Table 3.2, or by the WPS, as applicable, shall be provided. Backing bars may remain in place unless required to be removed by this Specification or the Drawings, by AWS D1.1, Section 5.10.4, or by AISC Specification Section J1.5.

B. Heavy Section Splices Requiring Removal of Backing Bars: All welded tension splices of Heavy Sections, shall have the backing bars removed. Where fusible backing material is used, the root pass area shall be backgouged after backing bar removal, and backwelded until flush or with slight reinforcement. The surface shall then be ground smooth, to a surface roughness not to exceed 500 microinches. Notches and gouges shall be repaired to the requirements of AWS D1.1, Section 5.15.4.4.

C. Moment Connection Joints Requiring Removal of Backing Bars: Backing bars shall be removed from the joint when required on the design drawings. Following removal of backing, the root pass shall be backgouged to sound weld metal, and backwelded.

1. Backing bar removal may be performed by air carbon arc cutting (CAC-A), commonly referred to as air carbon arc gouging (ACAG), grinding, chipping, or thermal cutting. The process shall be controlled to minimize gouging and removal of base metal except for material immediately adjacent to the weld.
2. Following Magnetic Particle Inspection (MT) of the backgouged area, the root shall be backwelded. A reinforcing fillet weld with a minimum leg size of 5/16 inch or the root opening plus 1/16, whichever is larger, shall be provided. The reinforcing fillet weld need not be ground. Following completion of the reinforcing fillet weld, MT shall be performed on the fillet weld and the immediately adjacent area.

D. Should these joints be made without fusible backing, the backing material shall be removed, any unacceptable weld discontinuities removed by backgouging, the root backwelded as needed, the reinforcing fillet added as described above, and MT performed on the completed fillet weld and the immediately adjacent area. If the initial MT of the root shows no unacceptable discontinuities, no backgouging and backwelding is required.

3.05 WELD TABS

A. Use of Weld Tabs: Welds shall be terminated at the end of a joint in a manner that will ensure sound welds. Whenever necessary, this shall be done by use of weld tabs, also called extension bars and run-off tabs. Weld tabs shall extend beyond the edge of the joint a distance equal to a minimum of the part thickness, but not less than one inch. Weld tabs shall be oriented parallel to the joint preparation and to the weld direction. No weld dams are allowed.

B. Except as noted in the following sections, weld tabs shall meet the requirements of AWS D1.1, Section 5.3.1. Fusible weld tabs may remain in place unless their removal is required by the Specifications, by AWS D1.1, or by AISC Specification Section J1.5. Non-fusible weld tabs may be used in applications and locations where qualified in accordance with AWS D1.1, Section 4.

C. Heavy Section Joint Weld Tab Removal and Finish: All welded tension splices in Heavy Sections shall have the weld tabs removed and ground smooth to a finish of 500 microinches or better. Gouges and notches shall satisfy the requirements of AWS D1.1, Section 5.15.4.4, or shall be repaired to the provisions of AWS D1.1, Section 5.15.4.4.

D. Moment Connection Weld Tab Removal and Finish: Weld tabs shall be removed when required by the design drawings. Weld tab removal may be performed by air carbon arc cutting (CAC-A), grinding, chipping, or thermal cutting to within 1/8 inch of the base metal surface. For weld tabs used on continuity plates, removal within ¼ inch of the plate edge is adequate. The process shall be controlled to minimize gouging and removal of base metal except for that material immediately adjacent to the weld.

E. The edges where the weld tabs have been removed shall be ground smooth to a surface roughness value of 500 microinches or better. Grinding to a flush condition is not required. Gouges and notches are not permitted, and must be removed by grinding. The transitional slope of any area where gouges and notches have been removed shall not exceed 1:5. Material removed by grinding that extends more than 1/16 inch below the surface of the base metal shall be filled with weld metal placed using approved weld repair procedures.

F. The contour of the weld at the ends shall provide a smooth transition, free of notches and sharp corners. A minimum radius at the corner need not be provided.

G. Following removal and grinding to the required finish and contour, and the completion necessary repairs, the exposed ends of the weld shall be inspected using magnetic particle (MT).

3.06 WELD TOES

A. Weld toes, whether for groove welds or fillets welds, shall provide a smooth transition between the weld and base metal. The as-welded profile is adequate provided it satisfies the criteria of AWS D1.1, Section 5.24. No grinding is required.

3.07 WELD ACCESS HOLES

A. Weld access holes shall meet the dimensional, surface finish, and testing requirements of AISC LRFD Specification Section J1.6 and AWS D1.1, Section 5.17.1 and Figure 5.2, except as otherwise required by the Drawings. The provisions in AWS D1.1, Section 5.17.2 and Figure 5.2, Note 1 shall apply to all Heavy Sections.

B. The access hole shall be ground smooth to a surface roughness value not to exceed 500 microinches and shall be free of notches and gouges. For this purpose, a notch or gouge is any depression significantly deeper than the overall surface roughness.

C. Notches or gouges present from thermal cutting shall be removed by grinding, faired to a slope of not more than 1:5 against a straight cut surface, or to a radius of not less than 3/8 inch if in the curved portion of the cut surface. The depth of notches and gouges that may be repaired by grinding is not limited, provided the required dimensions, including tolerances, of the access hole are maintained.

D. Notches deeper than can be repaired by grinding, as above, may be repaired by welding. Prior to welding, the notch or gouge shall be ground to provide a smooth contour with a radius not less than

3/8 inch. The repair area shall be preheated to a temperature between 400°F and 550°F, measured at the point of welding immediately prior to welding. Filler metal meeting the requirements for the Seismic Force Resisting System shall be used. A written repair WPS for the application shall be followed. Following completion of welding, the area shall be ground smooth and flush to meet the contour and finish requirements for the access holes, with fairing of the welded surface to adjoining surfaces.

E. Prior to acceptance, the weld access hole shall be inspected using magnetic particle testing (MT) or liquid penetrant testing (PT) and shall be free of cracks. If a welded repair has been performed, magnetic particle testing (MT) shall be performed.

3.08 WEB WELD DETAILS

A. Unless otherwise shown on the drawings, shear tabs may be welded to the column using fillet welds, partial joint penetration (PJP) groove welds with reinforcing fillet weld and PJP groove weld, or a CJP groove weld.

B. When required by the design drawings, the beam web shall be welded to the shear tab using fillet welds. A minimum clear distance of ½ inch shall be provided between the weld access hole and the toe of the fillet weld connecting the shear tab and beam web.

C. Fillet welds should be detailed and made to terminate away a distance equal to or greater than the leg size from the beam end.

3.09 DOUBLER PLATE DETAILS

A. Web doubler plates, if required, may be welded using any of the three details of the AISC Seismic Provisions, Figure C-9.3, unless shown otherwise on the Drawings.

B. When Figure C-9.3(a) is used, the edges of the doubler plate shall be chamfered to an adequate bevel to facilitate access to the root of the weld. A square-edge and square groove weld between doubler plate and column is not acceptable. No grinding of the completed weld is required.

C. When Figure C-9.3(b) is used, the plate shall be chamfered to miss the radius of the column. The fillet weld, in both throat and leg size, as a minimum, shall be equal to or larger than the chamfer dimensions used for the doubler plate. No grinding of the completed weld is required.

3.10 COLUMN CONTINUITY PLATE DETAILS

A. Continuity plates, also referred to as stiffeners, shall have clips, sized to avoid interference with the radius of the column. Against the column flange, the size of the clip may exceed the radius (k1 dimension) by no more than ½ inch. Along the web, the clip shall extend a distance of approximately 1-1/2 inches beyond the published k dimension. The clip shall be detailed to facilitate suitable weld terminations for both the flange weld and the web weld, with a minimum radius of ½ inch.

B. The weld between the continuity plate and the column flange, unless otherwise shown, shall be a CJP groove weld for the full length of the groove preparation. The joint may use backing bars, or may be made without backing provided the root is backgouged and backwelded. If backing bars are used and remain in place, they shall receive a reinforcing fillet weld between the backing bar and column flange. No fillet weld should be placed between backing bar and continuity plate. The fillet weld size need not exceed the minimum size requirements of AWS D1.1, Table 5.8.

3.11 MOMENT CONNECTION BOTTOM FLANGE WELDING SEQUENCE

A. When welding the bottom flange to the column flange of moment-resisting connections in the Seismic Force Resisting System, the following sequence shall be followed:

1. When welding from Side A (one side of the beam), the root pass shall begin beyond the center of the joint on Side B, reaching past the beam web (or web plate, for FF connections) through the weld access hole (or opening, for FF connections). After the arc is initiated, travel shall progress toward the edge of the Side A beam flange, and the weld shall be terminated on the Side A weld tab.

2. The Side A root pass, and the root pass deposit on Side B, shall be thoroughly cleaned and visually inspected by the welder to ensure fusion, soundness, freedom from slag inclusions and excessive porosity. The resulting bead profile shall be suitable for obtaining good fusion by the subsequent root pass to be initiated from Side B. If the profile is not conducive to good fusion, the start of the first root pass shall be ground, gouged, chipped, or otherwise prepared to ensure adequate profile to achieve fusion.
3. The second half of the weld joint, from Side B, shall have the root pass applied before any other weld passes are performed. The arc shall be initiated in the area of the start of the first Side A root pass, and travel shall progress to the end of the joint, terminating on the Side B weld tab.
4. The above sequence shall be repeated for subsequent weld layers, and each weld layer shall be completed on both sides of the joint before a new layer is deposited. The order of operations (Side A, the Side B, or vice versa) is not restricted and may vary for each weld layer.

B. Only stringer passes are permitted. Weave beads are prohibited. Weld passes shall be placed in horizontal layers. Each pass shall be thoroughly cleaned of slag and wire brushed. Each pass shall be visually inspected by the welder, as described above in Step 2.

C. Both beam flanges should be completely welded prior to any supplemental welding to the beam web or shear tab or tensioning of the beam web bolts, unless otherwise detailed in the approved erection plan and the WPS.

3.12 REDUCED BEAM SECTIONS (RBS)

A. Holes and Attachments: No holes may be drilled or punched in either flange of the beam within the length that has received the radius cut, or between the RBS cut and the column. Shear studs, and mechanical deck fasteners to the beam flange within the length of the radius cut are prohibited. Spot welds for the attachment of metal decking are permitted.

B. RBS Cut Tolerances: The tolerance on the depth of each RBS cut is plus or minus ¼ inch, measured at the mid-thickness of the flange at the narrowest point of the cut flange. The length of the cut shall be within plus or minus 15% of the specified length. The depth of cut on each side shall be balanced, with no more than 3/8 inch total variation in the depth of cut from one side to the other. (Example: plus 1/8 inch on one side, minus ¼ inch on other side.) The balance of remaining flange width about the web of the beam is not a consideration.

C. Cut Surface Roughness: After thermal cutting, the RBS surface shall have a surface roughness of no more than 500 microinches (AWS sample 3). Grinding thermally cut edges shall be provided, as necessary, to meet this criterion. Corners between the cut RBS surface and the top and bottom of the flanges shall be ground to remove sharp edges, but a minimum radius or chamfer is not required.

D. Gouges and Notches: Gouges and notches that occur in the thermal cut RBS surface may be repaired by grinding if not more than ¼ inch deep. The gouged or notched area shall be faired by grinding so that a smooth transition exists, and the total length of the area ground for the transition shall be no less than 10 times the depth of the removed gouge. If a sharp notch exists, the area shall be inspected by MT after grinding to ensure that the entire depth of gouge or notch has been removed. Grinding may not increase the depth of the RBS cut section more than ¼ inch beyond the specified depth of cut nor may it increase the cut beyond the RBS cut tolerances specified herein.

E. Welded Repair of Notches and Gouges: Gouges and notches that exceed ¼ inch in depth, but not to exceed ½ inch in depth, and those notches and gouges where repair by grinding would increase the effective depth of the RBS cut beyond tolerance, may be repaired by welding. Notches and gouges exceeding ½ inch in depth may be repaired only with the approval of the Owner's Representative. The notch or gouge shall be removed and ground to provide a smooth radius of not less than 3/8 inch for welding. The repair area shall be preheated to a temperature between 400°F and 550°F, measured at the location of the weld repair approximately one minute after removal of the heating source. Repair welding shall be done with notch-tough electrodes meeting the requirements in for filler metal used in the Seismic Force Resisting System. A repair WPS is required. Following welding, the repair weld shall be ground to a smooth contour meeting the RBS requirements with a surface roughness not to exceed 500 microinches. The welded repair area shall be inspected using magnetic particle testing (MT).

3.13 HEAVY SECTIONS

A. General: See AISC Specification Section A3.1c for materials requirements, J2.8 for preheat requirements, J1.6 for access hole requirements, and J1.5 for weld tab and backing bar removal requirements. See AISC LRFD Figure C-J1.2 for dimensional and fabrication requirements for standard weld access holes. See Weld Access Holes in this Section for further requirements.

B. Access Hole Requirements: Weld access holes must be preheated to a minimum of 150°F prior to thermal cutting, ground to 500 microinches (bright metal), and inspected for cracks using either penetrant testing (PT) or magnetic particle testing (MT). Optionally, weld access holes may be made by drilling and sawcutting without grinding, but PT or MT of the cut surface is still required.

C. Welding: For joint welding, the minimum preheat and interpass temperature shall be 350°F. Weld tabs and backing bars shall be removed after completion of the joint, ground smooth to a maximum surface roughness of 500 microinches, with reinforcement not to exceed 1/8 inch, at a transition slope not to exceed 1:10.

3.14 REPAIR OF DISCONTINUITIES IN MAIN MEMBERS

A. In lieu of AISC Seismic Provisions Section 7.3c, the provisions of this section shall apply to beams in the Seismic Force Resisting System where repairs are needed to the beam between the column flange and a point away from the centerline of the cut radius equal to one half the depth of the beam, but no closer than the far edge of the radius cut.

B. Tack Welds: Tack welds are permitted if made prior to beginning welding of the joint. Tack welds for backing bars and weld tabs must be made within the groove weld joint. Tack welds for attachment of parts prior to fillet welding are acceptable, provided they are covered by the completed fillet weld.

C. Tack welds outside these locations must be removed by grinding or chipping. Air carbon arc gouging and thermal cutting to remove tack welds in these areas is not permitted. Following the removal of unacceptable tack welds, the weld area shall be ground to a depth of 1/16 inch, and faired to adjacent surfaces on a slope not to exceed 1:5.

D. Erection Aids: Unless requested by the Contractor and approved by the Owner's Representative in advance, the use of welded attachments as erection aids within the designated areas is prohibited. If erection aids are placed within the designated area in error, or cannot be avoided, the Owner's Representative's approval of the aid's placement, use, and the repair method is required.

E. Air carbon arc gouging is permitted for the removal of welds to within 1/8 inch of the base metal surface. Any remaining weld deposits shall be removed by grinding to a depth 1/16 inch below the surface, faired to adjacent surfaces on a slope not to exceed 1:5.

F. Air Carbon Arc Cutting and Thermal Cutting: Air carbon arc cutting (CAC-A) and thermal cutting is permitted within the above regions when required for the removal of backing bars and weld tabs, as specified in these documents. The use of these processes for repairs to or removal of base metal or welds in the above region is permitted only with the prior approval of the Owner.

3.15 AREA WELDING LIMITATIONS

A. After welding of continuity plates and doubler plates, test column webs for cracking using liquid penetrant (PT) or magnetic particle testing (MT) over a zone 3 inches above and below the continuity plate or doubler plate welds. Testing may be performed after the weld has cooled to ambient temperature.

3.16 SURFACE FINISH

A. Flush Surfaces: Welds in butt joints required to be flush shall be finished so as to not reduce the thicknesses of the thinner base metal or weld metal by more than 1/32 inch, or 5% of the material thickness, whichever is less. Remaining reinforcement shall not exceed 1/32 inch in height. However, all reinforcement shall be removed where the weld forms part of a faying or contact

surface. All reinforcement shall blend smoothly into the plate surfaces with the transition areas free from undercut.

B. Finish Methods and Values: Chipping and gouging may be used, provided these methods are followed by grinding. Where surface finishing is required, surface roughness values shall not exceed 250 microinches, unless otherwise noted or specified in this Specification. Regardless of the surface finish required, the direction of grinding marks may be in any direction.

C. Measurement of surface finish values by visual appearance or tactile comparison is acceptable.

3.17 WELD ACCEPTANCE CRITERIA

A. Owner Representative's Authority: Welds or portions of welds that fail to meet the acceptance criteria of AWS D1.1 shall be repaired or replaced. The Contractor may request acceptance by the Owner Representative of a weld discontinuity, without repair or replacement, when the Contractor can prove that the effect of the discontinuity will not be detrimental to the performance of the structure. The Owner Representative is the final authority for acceptance of such welds.

B. Magnetic Particle Testing: If a surface or near-surface discontinuity, within 1/8 inch of the surface, is detected, the discontinuity shall be rejected and removed. If the separation from the surface cannot be determined, the discontinuity shall be categorized as a surface flaw, rejected and removed.

C. Regions of welds that cannot be inspected shall be identified and recorded, and the Owner Representative shall be notified in writing.

D. Ultrasonic Testing – Flaw Detection: When ultrasonic testing is required, the joint shall be scanned for flaw detection purposes following the procedures prescribed in AWS D1.1, Annex K, with exceptions as noted below. Joints that fail the acceptance criteria described below may be inspected using the Ultrasonic Testing – Flaw Sizing methods as prescribed in this Specification or, at the Contractor's option, may be excavated for further investigation and repaired, then reinspected using these Flaw Detection procedures.

E. When ultrasonic testing is required, CJP and PJP groove welds in Seismic Force Resisting System shall be scanned for flaw detection. Acceptance criteria shall be as for statically loaded welds in AWS D1.1, Annex K, Table K-1.

F. Joints with backing bars remaining in place shall not be rejected on the basis of indication ratings (db values) from the interfaces between backing bar and base metal or backing bar and weld. The UT Procedure shall prescribe methods for distinguishing between backing bar indications and root discontinuities.

G. PJP groove weld joints shall not be rejected on the basis of indication ratings (db values) from the root area of the weld. Notches within the weld, located a distance more than 1/8 inch from the as-welded root, shall be scanned for acceptance using the criteria above.

H. Regions of welds that cannot be inspected shall be identified and recorded, and the Owner Representative shall be notified.

I. Regions of welds adjacent to cope holes may be inspected with multiple probe techniques.

J. Ultrasonic Testing – Flaw Sizing: Ultrasonic testing for flaw sizing shall be performed following written procedures as required by AWS D1.1, Annex K. When flaw-sizing techniques are implemented, the following acceptance criteria applies to groove welds:

1. If a surface or near-surface flaw (within 1/8 inch of the surface) is detected, the flaw shall be rejected and removed. If the separation from the surface cannot be measured, the flaw shall be categorized as a surface flaw, rejected and removed.
2. When backing bars that remain in place, the position of notch tips that extend into the weld metal shall be determined. The notch shall be rejected if it extends greater than 1/8-inch into the thickness of the weld. The weld present between the backing bar and column face shall not be considered a part of the weld thickness in determining the depth of notch or thickness of weld.

3. Embedded flaws, defined as those that do not come within 1/8 inch of the surface, shall be rejected if their height exceeds ¼ inch.
4. Embedded flaws shall be rejected if their area, as calculated by multiplying the maximum discontinuity height by the maximum discontinuity length, exceeds the thickness of the thinner parent metal multiplied by the thickness of the thinner parent metal.
5. Embedded flaws, either individually or as a group within a length of weld 12 inches or less, shall be rejected if they exceed a total area (the sum of the areas of individual discontinuities) equal to 10% of the thickness of the thinner parent metal multiplied by the weld length. The weld length used for this calculation shall not exceed 12 inches, with longer welds being evaluated in multiple parts.
6. Aligned discontinuities of lengths L1 and L2 separated by less than (L1+L2)/2 shall be evaluated as continuous.
7. Parallel discontinuities of heights H1 and H2 separated by less than (H1+H2)/2 shall be evaluated as continuous.

3.18 GAS CUTTING

A. The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on any member in the structural framing unless the approval of Owner's Representative has been obtained.

3.19 TOUCH-UP PAINTING

A. 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.

B. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

C. Cleaning and touch-up painting of field welds, bolted connections and abraded areas of shop paint on structural steel is included in Division 9 under painting work.

3.20 TEMPORARY PLANKING

A. Provide temporary planking for the safety of workmen and for the working platforms as required. Such temporary planking to remain in place, until approved to be removed from the project site.

3.21 CONNECTIONS

A. All shop and field connections to be welded or high-strength bolted unless otherwise indicated.

B. Completely fabricate all items of structural steel that are to be built into or anchored into masonry or concrete, complete with bolts, anchors, clips, stud anchors, etc., to engage with the adjacent construction.

C. Only light drifting will be permitted to draw parts together. Drifting to match unfair holes will not be permitted. Any enlargement of holes necessary to make connections to be done by reaming and twist drills, and the proper size bolts used.

D. Correct any error in shop or field work which prevents the proper assembling and fitting of parts by the moderate use of drift pins, or a moderate amount of reaming and slight clipping or cutting, at the expense of the Contractor.

END OF SECTION

SECTION 05300

STEEL DECK

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Steel decking.
2. Filler pieces and metal closure pieces.
3. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

B. Related work:

1. Division 5 for welded stud connectors.

1.02 SYSTEM DESCRIPTION

A. Unless noted otherwise on the Drawings, steel deck does not require shoring.

B. When the weight of wet concrete fill is expected to exceed the deck manufacturer's published data for safe capacity and allowable deflection, design, engineer, fabricate, assemble and install temporary shoring and its connection to adjacent construction to conform to the profiles indicated and to other requirements of the Contract Documents, to satisfy applicable governing codes and regulations, and to provide structurally sound assemblies until concrete fill has attained its 28-day strength.

1.03 SUBMITTALS

A. Data:

1. Submit steel deck manufacturer's product data, specifications, typical installation details and other data as necessary to demonstrate compliance with the Drawings, specified requirements and the requirements of the authorities having jurisdiction.
2. Submit the steel deck manufacturer's recommendations for welding rods.

B. Shop drawings:

1. Submit large scale, dimensioned shop drawings showing section profiles, trim, sizes, and material thickness/gage.
2. Include plan layout drawings showing openings, sump pans, supports, connections, welds and erection instructions.
   a. Identify welds by AWS welding symbols.
   b. Indicate temporary shoring of decking where required.
3. Coordinate shop drawings with the work of other trades that are part of, or will be incorporated into, the work of this section. Indicate the work to be performed by other trades, including adjacent and abutting materials to which this work is to be secured.

C. Certificates: Submit welder's certificates demonstrating welders to be employed in this work are current in their certification.

D. Installation instructions: Submit steel deck manufacturer-prepared instructions concerning the proper installation sequence of steel deck.

1.04 QUALITY ASSURANCE

A. Welder's qualifications: Qualify welding operators and welding procedures in compliance with AWS "Qualification" requirements of AWS D1.1 for steel and AWS D1.3 for sheet steel.

1. Verify welders to be employed in this work have satisfactorily passed AWS qualification tests and are current in their certification.
2. If re-certification is required, retesting will be Contractor's responsibility.

B. Regulatory requirements:

1. Comply with fire resistance ratings indicated and required by the authorities having jurisdiction.
2. Provide materials, accessories and application procedures listed by UL or tested in for the fire resistive construction ratings shown or required.

1.05 HANDLING

A. Delivery: Deliver materials to project site in original protective wrappings, clearly labeled with manufacturer's identification labels intact and legible, indicating manufacturer's name, type, source of product, UL classification, testing and inspection.

B. Storage:

1. Store materials above ground and under cover.
2. Store galvanized steel assemblies, separated with strip spacers, in dry, well-ventilated conditions to avoid wet storage stains.

C. Handling:

1. Handle steel decking that will remain exposed in the Work to prevent damaged during shipping and handling.
2. Work showing dents, creases, burrs in cells, deformations, weathering or other defects affecting its use will not be accepted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Galvanized steel sheet: Structural quality: ASTM A 653 SS, Grade 33, G60 galvanized coating designation per ASTM A 525.

B. Miscellaneous steel shapes: ASTM A 36.

2.02 ACCESSORIES

A. Welding rods: Select welding rods in accordance with steel deck manufacturer's recommendations and AWS specifications for the metal alloy to be welded.

B. Galvanizing repair paint: Basis of design is for "90-97Tneme-Zinc" by Tnemec Co. Other acceptable manufacturers, when approved by the Architect, include the following:

1. "MZ-4" by Valspar Corp.
2. "Catha-Coat 303H" by Devoe Coatings.
3. "Amercoat 68HS" by Ameron Protective Coating Division.

2.03 FABRICATION

A. Decking:

1. Types and profiles indicated on the Drawings, formed in lengths to span 3 or more supports, unless otherwise indicated, with flush, telescoping, or nested ends, end laps and nesting side laps.
   a. Composite decking shall have either mechanically fixed shear devices such as embossments, holes or welded buttons, or inverted triangular shaped ribs.
   b. Fabricate decking supporting waterproofing membrane, roofing and elastomeric coating with vent tabs protruding and staggered in the low flutes, 12-inch maximum o.c., or other joint deformation, to provide a minimum 1.5-percent openings (uniformly distributed) of the total deck area for relief of vapor pressure; do not use vent tabs to support mechanical equipment.

B. Fabricate metal closure strips, column flashing and cover plates from sheet steel of the same quality as deck units.

C. Hangers for suspended ceilings: Fabricate lip tabs and integral tabs from minimum 16-gage galvanized steel, sized and shaped to safely support 100 lbs. pull through hole in tab.

1. Tabs shall project at least 2-inch below fireproofing.
2. Slots or holes punched in decking for installation of pigtail wires are not permitted, except for decking supporting insulating concrete.

D. Form roof sump pans from a single piece of galvanized sheet steel of same quality as deck units. Sump pans are recommended by NCRA but seldom used in the West.

1. Thickness shall be a minimum of 14-gage before galvanizing.
2. Fabricate with bearing flanges not less than 3-inch,< recess of 1-1/2-inch below deck surface, level bottom and sloping sides to direct water flow to drain.

E. Where steel deck will receive sprayed fireproofing, provide decking free of amounts of lubricants and oils which would impair the adhesion of the spray-applied fireproofing specified in Section 07810.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct detrimental conditions before proceeding with installation.

3.02 INSTALLATION

A. Install decking and accessories in compliance with their manufacturer's recommendations and the approved shop drawings.

B. Coordinate and cooperate with other trades in locating decking bundles to prevent overloading of structural framework.

C. Place decking on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting steel supports not less than 2-inches and masonry and concrete supports not less than 4-inches before fastening permanently.

1. Do not stretch or contract side lap interlocks. Place decking in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting deck units.
2. Cut and fit decking and accessories around other work projecting through or adjacent to the decking as shown on the Drawings. Provide neat, square and trim cuts.

D. Place roof sump pans over openings in steel deck and weld to top decking surface.

1. Space welds at 12-inch o.c. maximum with a minimum of one weld at each corner.
2. Cut opening in bottom of pan for roof drain accurately.

E. Do not use decking for storage or working platforms until permanently secured.

1. Coordinate protection and bracing of metal decking used as runway for transporting concrete.
2. Verify that decking manufacturer's directions for protection are followed.

3.03 FASTENING

A. Welding: Weld decking permanently to steel supporting members. Comply with the Drawings and AWS D1.1, Structural Welding Code - Steel, and AWS D1.3, Structural Welding Code - Sheet Steel.

B. Side joints: Fasten interlocking side closures as noted on the Drawings.

3.04 OPENINGS

A. Reinforce openings as indicated on the Drawings.

B. Provide additional steel reinforcing and closure pieces as required for strength, continuity of decking and support of other work as shown.

1. Provide openings required for work of other trades that are not indicated on Drawings only after approval from the Architect of proposed size, location and reinforcing. Cost of such openings and their reinforcing shall be borne by the Contractor.

C. Form metal closure plates to configuration required to provide tight-fitting closures at open ends of cells of flutes and sides of decking.

1. Adjusting plates: Provide in locations too narrow to accommodate full-size deck units and install as recommended by the deck manufacturer and as indicated on the approved shop drawings.
2. End closures: Provide metal cover plates or joint tape at joints between decking sheets to be filled with concrete to prevent concrete leakage.
3. Column flashing: Provide between floor decking and columns that penetrate the deck. Field cut flashing to fit and tack weld to decking and columns.
4. Access hole covers: Provide to seal holes cut in decking to facilitate welding of decking to structural supports.

3.05 ATTACHMENTS

A. Coordinate location, spacing and type of connections required to attach wood nailers, suspended ceilings and similar items to decking.

B. Drill decking as shown and as required by approved shop drawings.

3.06 CLEANING AND TOUCHING-UP

A. Remove slag from welds, clean to bright metal and touchup with zinc-rich paint; also clean and touchup with zinc-rich paint raw edges of deck cut for openings.

B. Welds to be covered with concrete need not be slagged and painted.

3.07 FIELD QUALITY CONTROL

A. Site tests: The Owner will employ a testing agency to verify compliance with specified requirements.

1. Testing Agency will furnish qualified inspectors.
2. Tests and inspections shall comply with Code requirements, as amended by the regulations of the authorities having jurisdiction.

B. Site tests and inspection:

1. Testing Agency will inspect welds visually while welders are making welds at commencement of this work and again after the work is completed for penetration of weld metal, fusion, and general ability of operator. Defective welds shall be corrected in compliance with applicable provisions of AWS D1.1.
2. Testing Agency will be required to confirm welder's qualifications and to certify in writing upon completion of this work that the welding has been performed in compliance with Drawings and Specification requirements, including the use of AWS qualified procedures, the manufacturer's recommended use of automatic equipment, and the use of preheat, if required, and with all applicable requirements of regulatory agencies having jurisdiction.
3. The Testing Agency will report on the results of the inspection.

C. Survey: In addition to the survey required of the structural steel frame in Section 05120, the Contractor's surveyor shall also provide a survey of the steel decking to verify dimensions, elevations and tolerances. Deck edge closure strips shall be within 1/4-inch of the theoretical location shown on the Drawings.

END OF SECTION

SECTION 05402

LOAD-BEARING COLD-FORMED STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Exterior, vertical, cold-formed framing system consisting of non-axial, load bearing, punched channel studs and Cee-shaped steel studs.

B. Related work:

1. Division 9 for lightgage metal support systems.

1.02 SUBMITTALS

A. Product data: Submit a list of proposed products and materials to be provided for complete assemblies, along with manufacturer's product data, specifications, typical installation details and other data for each material listed to prove compliance with the specified requirements.

B. Shop drawings: Submit large scale, dimensioned shop drawings for all cold-formed steel framing assemblies.

1. Indicate framing member size and gage designations, number, type, location, and spacing.
2. Show attachments, clips, strapping, bracing, splices, bridging, accessories, and details required for proper installation.
3. Indicate and identify all fasteners and welds (with AWS symbols).

C. Certificates:

1. Mill certificates and galvanizing certificates: Signed by framing member/accessory manufacturer certifying compliance with material requirements.
2. Welder certificates: Submit certificates verifying welders to be employed in this work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, retesting will be Contractor's responsibility.

D. Manufacturer's installation instructions: Submit manufacturer-prepared instructions concerning the proper preparation and installation framing members and framing accessories.

1.03 QUALITY ASSURANCE

A. Installer's qualifications: Firm and individuals with a minimum of 3 consecutive years experience in the installation of specified products on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

B. Qualifications for welding work: Use qualified welders experienced in welding lightgage steel, and comply with AWS D1.1 and D1.3.

C. Regulatory requirements: Where fire-resistive construction is indicated, provide materials, accessories, and application procedures listed by UL, or tested according to ASTM E 119 for the type of construction shown, and approved by the authorities having jurisdiction.

1.04 HANDLING

A. Delivery: Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store off ground, either in a dry, ventilated, enclosed space or protected with suitable waterproof coverings.

C. Handling: Protect metal framing units from rusting and damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products from one of the following members of the Metal Stud Manufacturing Association, or Steel Stud Manufacturing Association:

1. American Studco, Inc.
2. Angeles Metal Systems.
3. Cemco.
4. Dietrich Industries, Inc.
5. Marino Industries, Inc.
6. Superior Steel Studs, Inc.
7. Clark Western.

2.02 STEEL FRAMING COMPONENTS

A. Studs: Channel-shaped with lipped flanges, punched web, size (depth) as shown on Drawings, thickness and grade required by structural design calculations.

B. Tracks: Same designation, coating, and thickness as studs except as otherwise noted, channel-shaped, solid web, depth compatible with studs, size, thickness and grade required by structural design calculations.

C. Accessories: Manufacturer's standard blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.

D. Bridging:

1. Cold rolled channel: 1-1/2-inch by 1/2-inch by 16-gage.
2. Bridging clip:

    a. Basis of design is for "BridgeClip" by The Steel Network, or equal.
    b. Provide attachment through stud punch-out clamping onto stud web and wrapping around bridging channel. Provide holes for screw attachment to stud web and channel.

3. Flat strap: Width and thickness required by structural design calculations. Rigid attachment to stud flange.
4. Bridging channel: Basis of design is for "BridgeBar" channel-shaped bridging with lipped flanges and integral formed clips by The Steel Network, or equal in gage and size required by structural design calculations.

2.03 MATERIALS

A. General: ASTM A 653 steel; SS Grade 50, Class 1 minimum tensile strength, unless otherwise indicated on the Drawings.

B. Protective coating:

1. Metal framing shall be galvanized with a G90 zinc coating.
2. Accessories shall be finished to match main framing components.

2.04 FASTENERS

A. Screws: Corrosion-resistant coated, self-drilling, pan or hex washer head. Provide screw type and size required by structural design calculations.

B. Anchor bolts and studs: ASTM A 307, Grade A, carbon steel, with hex-head carbon steel nuts and flat steel washers hot-dip zinc coated in compliance with ASTM A 153. Provide bolt or stud type and size as required by structural design calculations.

C. Expansion anchors: FS FF-S-325, Group II, Type 4, Class 1. Provide bolts of diameter and length required by structural design calculations and listed or approved by one or more of the following:

1. Underwriters' Laboratories, Inc.

2. Factory Mutual.
3. International Conference of Building Officials.

D. Powder-actuated fasteners: FS FF-P-395 manufactured from AISI 1062 or 1065 steel, austempered to a minimum core hardness of 50 to 54 HRC and zinc plated in accordance with ASTM B 633. Provide fasteners listed or approved by one or more of the following and of type, diameter and length as required by structural design calculations:

1. Underwriters Laboratory.
2. Factory Mutual.
3. International Conference of Building Officials.

E. Welding electrodes: Comply with AWS Code and as recommended by stud manufacturer.

2.05 GALVANIZING REPAIR

A. Where galvanized surfaces are damaged, prepare surfaces and repair in compliance with procedures specified in ASTM A 780 using galvanizing repair paint specified in Section 05500, or SSPC-Paint 20, spray-can applicator.

2.06 FABRICATION

A. General:

1. Framing components may be prefabricated into assemblies before erection. Panels shall be designed to resist, without damage and permanent deflection, handling dead and live loads.
2. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.
3. Space studs no more than 1/8-inch from designated spacing.
4. Prefabricated panels shall be no more than 1/8-inch out-of-square within the panel length.
5. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Make all stud-to-track connections prior to handling the panel.
6. Lift prefabricated units to prevent damage and distortion.

B. Cutting: Cut members by shearing or sawing.

C. Fastenings:

1. Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer and accepted on the shop drawings.
2. Wire tying and screw attachment of framing components, unless otherwise indicated, is not permitted.

D. Fabrication tolerances: Fabricate to a maximum tolerance variation from plumb, level, and true to line of 1/8-inch in 10 feet, nor 1/4-inch overall.

E. Damaged zinc coating: Touchup damaged galvanizing before shipment of assemblies to site.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 INSTALLATION

A. General:

1. Install metal framing systems in compliance with their manufacturer's instructions, ASTM
2. C 1007, and these Specifications.
3. Field cutting is allowed with saws or shears, but not torch cutting. Restore damaged zinc coating as specified.
4. Reinforce holes cut thru the studs.

B. Runner tracks:

1. Install continuous tracks sized to match studs.
2. Align tracks accurately to layout at base and tops of studs. Secure tracks as accepted on shop drawings.
3. Fasten tracks securely to supports.

C. Studs:

1. Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges, as accepted on shop drawings.
2. Install members in single piece lengths except that tracks may be spliced, butt-welded, or each length anchored to a common building frame element.
3. Set studs plumb within the tolerance specified, except as needed for diagonal bracing or required for out-of-plumb walls or warped surfaces and similar requirements.
4. Where stud system abuts structural columns or walls, anchor ends of stiffeners to supporting structure.
5. Where components are boxed to form closed tubes, fill those areas that would otherwise remain uninsulated with insulation after assembly of the framing members.
6. Install insulation in framing spaces of insulated assemblies made inaccessible after erection.

D. Supplementary framing:

1. Install supplementary framing, blocking, and bracing in metal framing system wherever walls are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall.
2. Comply with stud manufacturer recommendations and industry standards in each case, considering weight or loading resulting from item supported.

E. Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than 2 are indicated.

1. Install runner tracks and jack studs above and below wall openings.
2. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall.
3. Secure stud system wall opening frame in manner indicated.

F. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

1. Frame both sides of control joints in lath/plaster construction; do not bridge the joint with system components or accessories.

G. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 54 inches O.C.

H. Welding:

1. Perform welding in compliance with AWS recommendations by welders qualified to weld lightgage metal.
2. Provide stitch plates where studs are burned-through.

I. Erection tolerances:

1. Bolt or weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true-to-line joints.
2. Set exterior edge of studs within 1/8-inch in or out of the theoretical plane of the wall.
3. Maximum variation in plane and true position shall not exceed L/960 from plumb and level.

3.03 FIELD QUALITY CONTROL

A. Site tests and inspection: The Owner will employ a qualified testing laboratory to perform the following tests and submit test reports.

B. Testing agency will review and approve Weld Procedure Specifications submitted by the Contractor. The testing agency shall visually observe welding procedures to certify the WPS plan is followed.

1. Perform visual inspection of a minimum of 20-percent of all welds.
2. Additional testing will be required for the following:

a. If more than 5-percent of the tested welds are rejected, than an additional 20 percent of all the welds shall be tested. This additional testing process shall be repeated until the rejection rate drops below 5 in 100.
b. Costs of additional inspection required by this paragraph shall be borne by the Contractor.

C. Testing and inspections and shall be in conformance with the CBC.

3.04 TOUCHUP

A. Touchup damaged shop-applied protective coating, including cut ends and welds.

B. Use zinc-rich primer for prime-coated and galvanized surfaces. Sand or grind damaged zinc coating to bright metal and apply zinc-rich paint, to a minimum DFT of 2 mils, overlapping undamaged area at least 2 inches. Comply with ASTM A 780.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide miscellaneous metal fabrications as indicated, specified, and required.

A. Work Included:

1. Elevator threshold angles and separation screens.
2. Steel ladders.
3. Gratings and frames.
4. Pipe and flat steel railings except pipe railings at steel stairs.
5. Above-ceiling supports.
6. Concrete-filled pipe bollards.
7. Countertop supports.
8. Trench drains.
9. Pit covers for sump pumps.
10. Steel ledger angles for masonry.
11. Non-standard steel connectors for wood framing.
12. Trash area steel tube and sheet metal gates.
13. Steel checkerplate wall protection as indicated.
13. Barrier bars.
15. Height limit signs.
16. Vehicle barriers.
17. Galvanized steel sleeves for window washing equipment.
18. Other miscellaneous metal fabrications required to complete the Work.

B. Related Work:

1. Finish painting.
2. Setting of anchor bolts and inserts in concrete or masonry.
3. Steel stairs including steel stair pipe railings.
4. Steel backing plates on steel stud walls.
5. Installation of non-standard steel connectors for wood framing.
6. Installation of ledger angles for masonry.

1.02 REFERENCES: Materials and Work shall conform to the latest edition of the reference standards and specifications listed below and specified herein, fire ratings required, and applicable codes and requirements of authorities having jurisdiction. The following specifications, codes, publications, and standards listed below, and later referred to by basic designation only, form a part of this Section to the extent specified:

A. American Institute of Steel Construction (AISC):

Code of Standard Practice for Steel Buildings and Bridges.
Specification for Design, Fabrication and Erection of Structural Steel for Buildings.
Steel Construction Manual.

B. American Society for Testing and Materials (ASTM):

A36/A36M-01..... Carbon Structural Steel.
A53/A53M-01..... Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.
A123/A123M-01 ... Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
A167-99..... Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

American Society for Testing and Materials (ASTM) - Continued

A307-00 ..... Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
A500-901 ..... Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
A501-01 ..... Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

C. American Welding Society (AWS):

D1.1-96 ..... Structural Welding Code - Steel.

D. Steel Structures Painting Council (SSPC):

SP3-82 ..... Power Tool Cleaning.
SP6-82 ..... Commercial Blast Cleaning.
SP7-82 ..... Brush-Off Blast Cleaning.

E. Military Specification (DOD and MIL):

DOD-P-21035A .... Paint, Zinc-Rich, Galvanizing Repair.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit Shop Drawings fully detailing Work of this Section, including accessories, fastenings, and welding. Include minor connections and fastenings not indicated or specified to meet required conditions; indicate in detail on Shop Drawings.

B. Samples: Submit the following:

1. Wall railing brackets.

1.04 QUALITY ASSURANCE: Conform to Code, Titles 8 and 24 CCR, and AISC Code of Standard Practice for Steel Buildings and Bridges; AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings; AISC Steel Construction Manual; and AWS D1.1, Structural Welding Code.

1.05 DELIVERY AND HANDLING: Protect items from damage during shipping, handling and storage. Work showing dents, creases, deformations, weathering, or other defects is not acceptable. Deliver welding electrodes to site in unbroken packages bearing manufacturer's name and contents identification.

1.06 PROJECT/SITE CONDITIONS: Verify field measurements prior to fabrication of the items. Use caution to protect concrete floor surfaces and adjacent Work from damage.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS: Furnish materials conforming to the following:

A. Steel Shapes: ASTM A36.

B. Steel Tubing: ASTM A36 or ASTM A500, Grade B.

C. Steel Pipe: ASTM A53, Grade B.

D. Bolts and Nuts: ASTM A307.

E. Electrodes: AWS D1.1, E70XX Series as required for intended use.

F. Primer: Red oxide, zinc chromate-free, metal primer conforming to CARB and AQMD regulations.

G. Non-Shrink Grout: Conforming to U.S. Army CE CRD-C 621, non-gas-forming type grout free of oxidizing catalysts and inorganic accelerators, non-staining non-rusting type in exposed areas, conforming to all current EPA requirements.

H. Galvanizing: ASTM A123 hot dip, 2.0 ounces psf on actual surface and 1.8 oz psf minimum on any specimen, and as specified.

I. Galvanizing Repair Material: All States Galvanizing Powder or Drygalv by American Solder and Flux, hot applied repair material, or anodic zinc-rich galvanizing repair paint conforming to Mil Spec DOD-P-21035.

2.02 GENERAL FABRICATION REQUIREMENTS: Conform to approved submittals, Article "Quality Assurance" above as applicable to the Work, and requirements herein. Fabricate and form the Work to meet actual installation conditions as verified at the site. Obtain necessary templates and information and provide all holes and drilling indicated or required for securing Work of other trades to metal fabrications.

A. Welding: Conform to AWS D1.1, as modified by referenced AISC Standards, and as indicated or noted on Drawings. Unless otherwise indicated or specified, weld joints by the shielded electric-arc method. Grind exposed welds to smooth surfaces free of holes, slag, or other defects, flush with adjoining surfaces. No finishing treatment is required for concealed welds. Cut out all defective welding and replace.

B. Shop Priming: Clean metal surfaces according to SSPC SP6-82 Commercial Blast Cleaning for metal items to remain exposed and finish painted; according to SSPC SP3-82 Power Tool Cleaning or SP7-82 Brush-Off Blast Cleaning for metal items to be concealed. Promptly apply shop coat of metal primer to minimum 1.0 mil dry film thickness. Work primer into joints. Do not prime metal surfaces embedded in concrete or masonry. Shop prime all ferrous metal items not to be galvanized unless otherwise indicated or specified.

C. Galvanizing: Galvanize specified items after fabrication is completed and produce coatings free of roughness, whiskers, unsightly spangles, icicles, runs, barbs, sags, droplets, and other surface blemishes.

D. Miscellaneous Items: Fabricate items not specifically mentioned according to the Drawings, approved Shop Drawings, and as required to complete the entire Work. Galvanize exterior items and shop prime interior items unless otherwise shown or specified.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to the Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

3.02 GENERAL INSTALLATION REQUIREMENTS:

A. Grouting: Provide grouting for Work of this Section as shown, specified, and required. Use non-shrink grout and conform to manufacturer's directions.

B. Galvanizing Repair: Wire brush welds and damaged coating to clean bright metal. Apply one coat of galvanizing repair paint where surfaces are concealed or are to be finish painted. Use the specified hot-applied galvanizing repair compound where surfaces remain exposed and unpainted.

C. Shop Prime Coat Repair: Do not apply metal primer in wet weather unless the steel is protected from dampness and is dry. Clean field welds, field bolts, and all damaged shop primer after erection and apply a spot coat of the same primer used for the shop coat.

D. Fasteners: Provide fasteners and connectors of approved types as required for the installations, whether or not indicated. Provide galvanized fasteners for galvanized items and for exterior use.

3.03 SCHEDULE OF ITEMS:

A. General: Following list of specific items is not necessarily complete. Check all Drawings, other Sections, and with other trades, and provide miscellaneous metal fabrications as required to complete the entire Work.

B. Specific Items:

1. Miscellaneous Metal Fabrications For Elevators: Provide with a shop prime coat finish. Coordinate with requirements of Elevator Shop Drawings.

a. Elevator Threshold Angles: Sizes and connections shown.

b. Separator Screens: Fabricate of 1-1/2" diamond mesh 10-gage woven wire fabric, with frames of 1" steel channels and shapes, frame joints full welded and ground smooth or mortised and tenoned and peen riveted, mesh wires extended through holes in frames, clinched, and spot welded at 6" intervals.

2. Steel Ladders: Construct as shown and according to Code, Title 8 CCR, and ANSI A14.3. Continuously weld all joints and grind welds smooth and flush, and provide required brackets and attachments. Galvanize ladders after fabrication.

3. Gratings: As manufactured by Borden, Irving, IKG Industries, Grating Pacific Inc., or equal, galvanized steel gratings and frames, all grating edges banded full height. Space bearing bars for maximum 1/2" clear opening and size for 100 psf live load based on the required spans where subject to foot traffic. Fabricate gratings in sections weighing not over 75 pounds per panel. Include galvanized steel angle or shape frames as shown or required. Structural steel supports for gratings are specified in Section 05120. Include complete structural calculations for gratings in the Shop Drawings, prepared, signed, and sealed by a California registered structural engineer employed by the Contractor or grating manufacturer.

4. Pipe Railings: Standard weight steel pipe, joints mitered at angles and coped at intersections unless otherwise shown, and continuously welded, all welds ground smooth and flush. Provide cast malleable steel brackets with mounting plates for railings on walls. Return exposed rail ends to within 1/2" of walls unless otherwise shown. Galvanize exterior railings only.

5. Above-Ceiling Supports: Provide steel hangers, supports, attachments, and other framing for support of ceiling-hung items such as toilet compartments. Conform to approved Shop Drawings of related trades.

6. Steel Channel Opening Frames: Corner joints mitered, full welded, and exposed welds ground smooth and flush. Provide galvanized sheet metal guards behind hardware attachment points. Galvanized frames embedded in concrete or masonry.

7. Concrete-Filled Pipe Bollards: ASTM A53 Grade B steel pipe with top edges ground smooth, galvanized. Fill with 3,000 psi concrete domed to shed water.

8. Trench Drains: By Borden, Irving, or equal, traffic weight galvanized gratings and frames complete with galvanized steel drain pans, fabricated in sections weighing not over 75 pounds per section.

9. Sump Pump Pit Cover: Steel angle frame and intermediate beam, cover of 1/4" thick steel checkerplate, all galvanized. Secure cover with galvanized steel flat-head screws at corners and mid-points of edges.

10. Ledger Angles for Masonry: Coordinate the exact sizes, lengths, and attachment preparation, galvanize after fabrication, and deliver to the masonry trade for installation.

11. Non-Standard Connectors for Wood Framing: Fabricate as detailed or required. Deliver to carpentry trade for installation.

12. Countertop Supports: Provide supports for toilet room countertops, and other countertops where indicated; coordinate with Sections 06200 and 06410.

13. Steel Tube and Sheet Metal Gates: Of steel tubing, 12 gage for frame unless otherwise shown, frame joints mitered and full welded, Drill suitable vent holes in underside of bottom rails and hot-dip galvanize. Cover outside of gate with minimum 22 gage galvanized sheet metal siding, type and attachments as approved. Equip with heavy-duty galvanized steel pipe sleeve hinges, and galvanized steel cane bolts with embedded galvanized steel pipe strikes for gate open and closed positions, gates with hasp locks.

14. Embedded Steel Items: Provide miscellaneous embedded steel shapes, angles, and channels, complete with welded anchors and galvanized. Without limitation, include pit nosings.

15. Pit Covers for Sump Pumps: Steel angle frames with welded anchors, and perforated steel covers secured with brass screws, all steel galvanized.

16. Steel Checkerplate Wall Protection: Steel checkerplate not less than 1/4" thick, edges ground smooth and corners slightly rounded, one-piece sizes wherever adequate sizes are available. Hot-dip galvanize after fabrication and drilling for anchors. Secure to concrete walls with cinch anchors and galvanized steel bolts near all corners and at maximum 12" centers along all edges.

17. Barrier Bars: Steel tubing of the diameter shown, formed with smoothly curved full-diameter angles. Galvanize the portion of vertical parts to be embedded in concrete. Finish painting and lettering are covered under Sections 09900 and 10400.

18. Height Limit Signs: Steel chains, steel tubing, and flat steel sign parts, all as detailed, welds ground smooth and flush, and shop prime. Chains shall be galvanized. Finish painting and lettering are covered under Sections 09900 and 10400.

19. Vehicle Barriers: Construct of galvanized steel sections and shapes as detailed. Secure channel-shaped horizontal members to vertical channels with stainless steel fasteners to permit easy replacement of damaged horizontal members.

20. Sleeves for Window Washing Equipment: Fabricate of minimum 10 gage steel plate of tubing, and galvanized after fabrication.

END OF SECTION

SECTION 05510

STEEL STAIRS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Steel stairs and landings.
2. Railings attached to steel stairs.
3. Supplementary parts and components, such as inserts, clips, bracing, hangers, fasteners, anchors and other miscellaneous supports required for a complete installation.

B. Related work:

1. Division 3 for reinforced concrete fill in stairs and landings.
2. Division 5 for railings other than those attached to steel stairs.
3. Division 9 for finish painting stairs and their handrails.

1.02 REFERENCES

A. AISC Design, Fabrication and Erection of Structural Steel for Buildings.

B. AISI, Specifications for the Design of Cold-Formed Steel Structural Members.

C. AWS D1.1, Structural Welding Code - Steel.

D. AWS D1.3, Structural Welding Code - Sheet Steel.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Provide metal stair assemblies, including wall supported railings, capable of withstanding the loads prescribed by Code without exceeding the allowable design working stress of the materials involved, including anchors and connections.
2. Apply each load to produce the maximum stress in each component.
3. Limit deflection of treads, platforms, and framing members under load to L/240 or 1/4 inch, whichever is less.
4. AWS D1.3, Structural Welding Code - Sheet Steel.

1.04 SUBMITTALS

A. Shop drawings: Show sizes, materials, methods of fabrication and assembly, finishes, installation and attachment to abutting and supporting construction.

B. Samples: The following finished as specified showing proposed weld quality.

1. Minimum 24 inches long by full height of guardrails for each type of railing indicated.
2. Full size samples of brackets.
3. Corner and coped section.

1.05 QUALITY ASSURANCE

A. Fabricator/installer's qualifications: Firm experienced in producing metal stairs similar to those indicated for the Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Engineering:

1. The Contractor is responsible for the engineering, fabrication and installation of the stairs and their connections to the structure within the physical limitations indicated on the Drawings.

2. Drawings and calculations for the stair assemblies shall be prepared by a California-licensed professional engineer.
3. Submit drawings and calculations to authorities having jurisdiction for approval, and pay fee(s) incurred thereby before start of installation.
4. Provide structural calculations prepared in compliance with referenced documents and these Specifications. Calculations shall be legible and shall incorporate sufficient cross references to shop drawings to make calculations readily understandable and reviewable. Test reports are not an acceptable substitute for calculations. Calculations shall include:
   a. Analysis of framing members.
   b. Analysis of anchors, including anchors embedded in concrete
   c. Section property computations for framing members.
   d. Seal and signature of design engineer.
5. Fasteners and connections are shown schematically.
   a. Fasteners or connections shall not conflict with or require revision of the finish profiles of the stairs or the supporting work.
   b. Connections to the structural frame shall not impose any eccentric loading, or induce twisting or warping.
   c. Connections to the structural frame shall be able to accommodate misalignment of the structure within limits allowed by the AISC tolerances.

C. Welding:

1. Qualify procedures and personnel according to AWS D1.1, Structural Welding Code-Steel, and AWS D1.3, "Structural Welding Code-Sheet Steel.
2. Verify that welders to be employed in this work have satisfactorily passed AWS qualification tests.
3. If recertification of welders is required, retesting will be Contractor's responsibility.

D. Special inspections:

1. Except where otherwise specified, special inspections by Owner's testing laboratory, prescribed by Code, will not be required when work is performed on the premises of a licensed fabricator, registered and approved by authorities having jurisdiction to perform such work without special inspection.
2. Submit certificates of compliance to demonstrate compliance with the above requirement.
3. Costs for fabricator tests, inspections and quality control shall be borne by the Contractor, including costs incurred by Owner for this inspection service when the fabrication is performed in an unlicensed shop.
4. Submit appropriate certification from the licensed fabricator shop or complete inspection reports signed by each inspector performing the unlicensed shop inspection before delivering stairs to the site.

1.06 HANDLING

A. Delivery: Deliver bolts, nuts and washers in bags or boxes, properly tagged for identification.

B. Storage: Above ground, under cover.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Stairs may be manufactured assemblies by Sharon Stair Systems, Inc., American Stair Corp. or Curoco Steel Systems, or may be fabricated in a local shop.

2.02 MATERIALS

A. Metal surfaces, general: Free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

1. Steel plates, shapes, and bars: ASTM A 36.
2. Steel tubing: Cold-formed steel tubing complying with ASTM A 500.
3. Steel pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

4. Uncoated structural steel sheet: Product type (manufacturing method), quality, and grade, as follows.
   a. Cold-rolled structural steel sheet: ASTM A 1008, Grade A, unless otherwise required by design loading.
   b. Hot-rolled structural steel sheet: ASTM A 1011, Grade 30, unless otherwise required by design loading.
5. Welding rods and bare electrodes: Select according to AWS specifications for metal alloy welded.

2.03 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. Bolts and nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Drilled-in expansion anchors:

1. Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [non-drilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade S, by Hilti, Inc., ITW Ramset/ Red Head, Star Expansion Co. or The Rawlplug Co., Inc.
2. Select anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488

D. Chemical anchors:

1. Chem-Stud by Rawlplug Co., Inc. or HIT C-100 System by Hilti used with machine bolts complying with FS FF-B-575, Grade S.
2. Select drilled-in and chemical anchors to resist loads imposed thereon with a safety factor of 4 minimum for static loads, and 10 minimum for dynamic and overhead loads.

2.04 PAINT

A. Shop primer for ferrous metal: Manufacturer or fabricator standard, fast-curing, lead-free, universal modified alkyd primer selected for compatibility with finish paint systems specified in Section 09900, and complying with performance requirements of FS TT-P645.

B. Bituminous paint: Cold-applied asphalt mastic complying with SSPC Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.05 FABRICATION

A. General:

1. Fabricate stairs, in compliance with the approved shop drawings, to the dimensions and profiles indicated.
2. Provide complete assemblies, including metal framing, handrails, railing systems, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs, landings and railings, and as required to anchor stair assemblies to the supporting structure.
3. Join pieces together by welding.
4. Form and fabricate this work to meet installation conditions. Conform to standard specifications, rules and practice of the AISC, Steel Construction Manual.
5. Accurately fit or miter joints with hairline contacts welded.
6. Shear and punch metals cleanly and accurately.
7. Remove sharp and rough edges.
8. Ease exposed edges to a radius of approximately 1/32 inch
9. Fabricate joints which will be exposed to the weather to exclude water, or provide weep holes where water may accumulate.
10. Close open ends of channel stringers with steel closure plates continuously welded, and ground flush and smooth with parent metal.

B. Railings:

1. 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.
2. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
3. At tee and cross intersections, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.
4. Form changes in direction of handrails and rails by bending.
5. Provide welded closures at ends of all handrails.

C. Welding: Weld corners and seams continuously to comply with AWS recommendations and the following:

1. Do not use stitch or tack welds on exposed surfaces.
2. Use materials and methods to 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, undercut edges of components to be welded, weld and finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
6. Where welds will be exposed to the elements, weld connections between various pieces continuously to prevent water intrusion in the weld area, or seal welded parts, after weld is ground, with silicone sealant specified in Section 07920.

2.06 SHOP PRIMING

A. Apply a heavy coat of bituminous paint to metal surfaces in contact with concrete or masonry. Do not apply on exposed surfaces.

B. Shop prime all other metal assemblies as follows:

1. Prepare surfaces in accordance with SSPC SP3 Power Tool Cleaning and the following.
2. Remove loose mill scale, rust, cutting and punching burrs, oil, grease and other deleterious materials before priming.
3. Immediately after surface preparation, apply primer in compliance with the paint manufacturer's printed instructions to provide a uniform dry film thickness of not less than 1-1/2 mils per coat. Use painting methods that will result in full coverage of joints, corners, edges and all exposed surfaces.
4. Apply primer to completely cover all exposed surfaces as well as surfaces concealed after assembly. Stripe paint corners, crevices, bolts, welds, and sharp edges.
5. Allow paint to dry thoroughly before handling.
6. Apply one coat of primer to surfaces exposed in the finished work, and 2 coats to surfaces that will be inaccessible after their assembly or erection.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 INSTALLATION

A. Install stairs and railings plumb, square, true to line and level, with tight, flush fitting joints.

B. Frame and securely anchor to structure in compliance with the approved shop drawings.

C. Adjust railings prior to fastening in place to insure proper matching at butting joints and correct alignment throughout their length.

1. Plumb posts in each direction.
2. Maintain constant dimension between nosings and railings and between railing balusters, as prescribed by Code.
3. Weld posts securely to stringers.
4. Grind weldments flush and smooth with adjacent surfaces.

3.03 TOUCHUP

A. General: Immediately after erection, clean field welds, bolted connections and abraded areas, and proceed as follows.

B. Damaged primer: Clean the damaged area, sand smooth, re-clean and spot-prime with the same paint as that used for shop priming applied to a minimum thickness of 2 dry mils.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide rough carpentry as indicated, specified, and required, complete. Include rough hardware and wood blocking, backing, nailers, grounds, stripping, and like items as indicated and required; and lumber treatments as specified.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Standard Grade Douglas Fir: Non-structural furring, blocking, stripping, grounds, and miscellaneous nailers and backing, grade-marked per WCLIB Grading Rules 16 or equivalent grade-mark by WWPA.

B. Plywood: PS1-95, Group I, Exterior type.

C. Nails: Common wire nails, galvanized.

D. Bolts and Nuts: ASTM A307, galvanized for exterior items and if embedded in concrete or masonry. Provide matching washers as required.

E. Lumber and Plywood Treatments: Cut wood and plywood to sizes required for installation prior to pressure treating.

1. Pressure Preservative Treatment: Pressure treat all wood and plywood resting on or embedded in concrete or masonry, and blocking and nailers for roof flashings, in accordance with American Wood Preservers Association Standard C2 and C9, water borne preservative, retention per the AWPA Recommended Retention Standard. Each piece of treated lumber and plywood shall bear the approved quality mark by an accredited ALSC third-party inspection agency. Do not use creosote. Re-dry as necessary to maximum 19% moisture content.

2. Fire-Retardant Pressure Treatment: Required for wood blocking, wood nailers, and plywood in metal framed walls, partitions, and ceilings, and where required by Building Code. All lumber species shall comply with UL surface-burning characteristics "FR-S" classification and bear UL identification showing "FR-S" classification and type of retardant. Pressure treat in accordance with American Wood Preservers Association Standard C20 and C27, Interior Type A, to flame spread rating of 25 or less and fuel contribution of 30 or less when tested per ASTM E84, each piece bearing UL label of conformance. Kiln dry after treatment to maximum moisture contents of 19% for lumber and 18% for plywood.

PART 3 - EXECUTION

3.01 WORKMANSHIP: Provide wood nailing strips, plates, blocking, and similar items shown or required. Bolt wood nailing strips and blocking in connection with metal. Recess bolt heads and nuts below surface, and provide washers where bearing directly on wood.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide and perform finish carpentry as indicated, specified, and required, complete.

A. Work Included:

1. Telephone and electrical backboards.
2. Installation of hollow metal doors and frames, and plastic faced wood doors.
3. Installation of finish hardware except as otherwise specified.

B. Related Work:

1. Furnishing hollow metal and plastic faced wood doors.
2. Furnishing finish hardware for doors.
3. Installation of hardware on aluminum doors.

PART 2 - PRODUCTS

2.01 TELEPHONE AND ELECTRICAL BACKBOARDS: Install Grade B-B Exterior plywood panels, 3/4" thick by 8-feet high. After sizing, fire-retardant pressure treat each piece as specified in Section 06100 to flame spread of 25 or less and smoke developed of 50 or less per ASTM E84 test. Secure panels to walls with stripes of contact adhesive, and molly-bolts at 24" centers around perimeter of each panel where panels are installed on framed walls. Run backboards from top of wall base.

PART 3 - EXECUTION

3.01 INSTALLATION OF FINISH CARPENTRY: Conform to requirements indicated and manufacturers' directions. Repair all damage as approved.

3.02 INSTALLATION OF HOLLOW METAL WORK: Conform installations to submittals approved under Section 08110 and manufacturer's instructions. Install frames plumb, straight, in correct alignment, rigidly connected to walls and building structure. Erect in proper sequence with other trades to prevent delays. Erect within the tolerances specified or shown in the approved submittals.

3.03 INSTALLATION OF PLASTIC FACED DOORS: Trimming of doors is not permitted. Drill pilot holes for all screws in plastic surfaces, holes of same diameters as screw shanks. Fit doors square and plumb with frames.

3.04 INSTALLATION OF FINISH HARDWARE: Install hardware supplied under Section 08710, excluding only hardware specified to be installed at the factory or under other Sections. Drill pilot holes for screws and screw home; hammer driving of screws is not allowed. After installation and fitting, remove finish hardware items on surfaces to be painted, except prime coat items, repack in original containers, and perform final installation, testing, and adjustment after finish painting is completed. Adjust hinges to swing smoothly but not loosely, without sticking or hingebound conditions. Adjust other hardware for correct operation.

END OF SECTION

SECTION 06410

CUSTOM CASEWORK

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide custom Lobby casework, including all cabinet hardware, complete.

A. Related Work:

1. Backing plates and blocking in walls and partitions for attachment of cabinets and casework.
2. Stone countertops.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit for the following items, bearing the WIC Certified Compliance Grade Stamp.

1. Steel backing plate locations required for anchoring of casework.
2. Plastic laminate finished Lobby casework.

B. Related work: Stone countertops.

C. Samples and Product Data: Submit the following items for selection and approval:

1. Full range of decorative plastic laminate patterns and colors, and cabinet liner colors.
2. Catalog data for each proposed cabinet hardware item with such Samples as the Architect may request.
3. Such other Samples or data the Architect may request.

D. Certificates: Submit as required in Article "Quality Assurance" below for fabricator and for installer.

1.03 QUALITY ASSURANCE: Work of this Section shall conform to the Manual of Millwork of the Woodwork Institute of California (WIC), 11th Edition, May 1, 2003, as amended, grades as specified herein or indicated. Prior to delivery to site, submit WIC Certified Compliance Certificates indicating each millwork product for the Work and that all products will fully conform to WIC grades and other requirements shown and specified. In addition, each unit of millwork and casework delivered to the project site shall bear a WIC Certified Compliance Label indicating the grade specified. Installer shall be certified by WIC and, upon completion of installation, shall furnish to Architect a WIC Certified Compliance Certificate for Installation covering all Work of this Section.

1.04 DELIVERY, STORAGE, AND HANDLING: Deliver the casework to the site covered and protected from the weather. Store in a clean dry and protected area meeting requirements of WIC Technical Bulletin 419-R, "Recommended Care and Storage of Architectural Millwork". Handle and transport items by methods that prevent damage or defacing.

1.05 PROJECT/SITE CONDITIONS: After installing, temporarily cover and protect the casework to prevent damage, staining, or marring by subsequent construction operations.

PART 2 - PRODUCTS

2.01 MATERIALS AND MANUFACTURE: Conform to WIC Manual unless otherwise shown or specified. Details on Drawings and requirements specified herein govern the type, arrangement, sizes, construction, and fabrication. In all other respects, manufacture Work of this Section to conform to the WIC grades specified.

A. Plastic Laminate Finished Cabinets: WIC Section 15, "Premium" or better grade, Style A Frameless, of Type II construction unless Type I construction is authorized by the Architect at specific locations, with high pressure decorative plastic laminate for exposed surfaces, both sides of hinged doors, and all edge banding. Finish semi-exposed surfaces with a minimum 0.020" thick high pressure laminate. Provide low pressure decorative polyester overlay in drawers or same as for the semi-exposed surfaces; low pressure decorative polyester or melamine overlay is not permitted for other uses. Use high pressure decorative laminate for bottoms and all edges of adjustable shelves, both sides and exposed edges of fixed shelves, and for all exposed surfaces in cabinets without doors or with glazed doors. Unless otherwise indicated or directed, all shelves shall be adjustable.

B. Cabinet Hardware: Hardware shall conform to BHMA Standards, Grade 1 for hinges, Grade 1 or 2 for other items. Grade 3 (residential) is not acceptable. Provide cabinet hardware as required for completely equipped installations, all of approved types. Include the following:

1. HINGES, concealed European type unless otherwise indicated or directed, with minimum 120° swing, Grade 2, Grass #950 Series or equivalent by Blum, Hafele, Hettich, Mepla, or Salici Domi.
2. PULLS -- bow style of mirror polished stainless steel, nominal 4" grip and 3/4" offset from door or drawer face, placed vertical on doors and horizontal on drawers.
3. MAGNETIC CATCHES -- minimum 7 pound pull, adjustable, Amerock V9765 or Epco 591-592. For pairs of doors without locks, for the door leaf with lock at locked pairs of doors, and single doors with or without locks.
4. ELBOW CATCHES -- Amerock B238-14A or Ives B225-B226, for inactive door leaf without lock at locked pairs of doors.
5. DOOR LOCKS -- National Lock C8102-75 or Corbin 0737, US26D.
6. DRAWER LOCKS -- National Lock C8138 or Corbin 0738, US26D.
7. KEYS AND KEYING -- masterkey all locks. Key alike locks in same room and where directed. Furnish 3 keys per lock except furnish 10 keys for keyed-alike groups.
8. DRAWER GUIDES -- minimum 75 pound load capacity, except 50 pounds for knee space drawers and 100 pounds for file drawers, full extension, self-closing from a 4" extension, sealed ball bearing nylon roller units having zinc-coated cold-rolled steel guides, by Grant, Knape & Vogt, or Accuride. Include two drawer stops per drawer, steel with rubber bumper.
9. ADJUSTABLE SHELF STANDARDS -- aluminum, let-in flush type, Grant 120 or Knape & Vogt 255.
10. ADJUSTABLE SHELF CLIPS -- Grant 21Z or Knape & Vogt 256; manufacturer same as the standards.
11. BASE ADJUSTERS -- Amerock D6009 with D6005 or Blum 697200.7700.
12. BASE ADJUSTER COVERS -- Dot Plug Buttons SS-48172, Handy Button 78, or Fastener Supply 51026.
13. MISCELLANEOUS ITEMS -- approved types, provided as required to fully equip all cabinets and casework.

C. Back Priming: Use exterior wood primer or enamel undercoater of the type specified in Section 09900; use care not to coat the exposed surfaces. Back prime following items:

1. Items so specified.
2. Casework installed against plaster, concrete, or masonry.

PART 3 - EXECUTION

3.01 INSTALLATION: Performed by cabinet manufacturer's experienced and skilled mechanics in accordance with approved submittals, scribed to walls and adjoining surfaces, and in accordance with the "Premium" grade requirements of WIC Manual using first class workmanship throughout.

A. Fixed Cabinets: Place base and wall cabinets level, plumb, and straight. Securely fasten to the walls and floors with concealed fasteners and anchors as required and approved. Conform anchorages to seismic restraint requirements of governing Code.

B. Cabinet Hardware: Fit and install cabinet hardware at the shop or mill in accordance with each hardware item manufacturer's instructions and templates as applicable. Adjust hinges to swing smoothly but not loosely, without sticking or hingebound conditions. Adjust other hardware items for correct operation. Prior to final inspection of the Work, again examine and readjust each hardware item as required and leave all hardware items in correct approved working condition.

3.02 CLEANING: Conform to Section 01740. Clean up waste, debris, and surplus materials resulting from installations, and tools and equipment, and remove from the site. Clean casework of dust, dirt, handmarks, oil, grease and all other soil, and leave clean and ready for use.

END OF SECTION

SECTION 07122

HOT RUBBERIZED WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide everything necessary for, and incidental to, the execution and completion of all the waterproofing at podium, planters, and terraces and complying with all manufacturer's requirements for a 10 year warranty.

1.02 SYSTEM DESCRIPTION: The new waterproofing system shall consist of a 215 mil thick hot rubberized waterproofing system, including a polyester reinforcement fabric.

A. A 1/4 inch thick composite drainage board shall be provided throughout the field of the podium.
B. Provide a 60 mil uncured neoprene sheet at the vertical deck-to-wall transitions, and all other required flashing accessories.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit six copies of the waterproofing manufacturer's Product Data, specifications, installation instructions, and recommendations for each principal waterproofing system product required.

B. Shop Drawings: Submit Shop Drawings showing all waterproofing conditions, bearing prior approval from waterproofing material manufacturer.

C. Manufacturer's Certification: Prior to the bid submit certification for each waterproofing application, and before any waterproofing materials are delivered to the job site, submit to the Architect a copy of the letter from waterproofing materials manufacturer stating the Waterproofing Subcontractor is an approved applicator of the materials to be used in the application of the waterproofing system.

D. Asbestos: Submit waterproofing material manufacturer's certification that all the products used for the installation of the waterproofing system are totally free of asbestos fibers, even trace amounts.

E. Test Results: Submit written documentation of results of calcium chloride testing.

1.04 QUALITY ASSURANCE

A. Products: Provide primary products including waterproofing membrane, etc., produced by a single manufacturer and provide secondary products acceptable to manufacturer of primary products.

B. Experience: Waterproofing Subcontractor shall have a minimum of 5 years experience in successfully applying the same or similar materials and shall be approved by the materials manufacturer.

C. Manufacturer Services: Arrange for the services of a representative of the waterproofing manufacturer for initial instructions in application of waterproofing materials. The manufacturer shall supply such service as required at no additional cost to the Owner. The manufacturer's representative shall perform, as a minimum, a visit during initial start-up and two site visits per week thereafter, and issue a letter of findings to Architect regarding installation procedures and overall acceptance of area visited.

D. Drawings: Coordinate with the Architect, manufacturer, and Contractor for clarification of Drawings prepared by the Architect for all details not included among the architectural drawings which become necessary to reflect any proposed changes, substitutions or clarifications to the Architectural Drawings. After award of Contract, all such changes require the Owner's approval.

E. Applicator Requirements: Waterproofing Subcontractor shall be currently approved and licensed by the manufacturer of the waterproofing materials to be used, and shall employ use only skilled workers completely familiar with the products and the manufacturer's current recommended methods of installation.

F. Application Methods: Except as modified and supplemented herein, Waterproofing Subcontractor shall follow the published requirements and written recommendations of the manufacturer of the waterproofing system and other material manufacturers. Concerning methods of installation, industry practices apply only when this Section does not address the matter.

G. Clarifications: If, in the opinion of the Contractor or Waterproofing Subcontractor, waterproofing is indicated on the Drawings or specified in a manner as to make it impossible to produce warranted work of highest quality, or should discrepancies appear from one Drawing to another, or between the Drawings and requirements specified, notify the Architect in writing for clarifications or instructions before proceeding.

H. Pre-Waterproofing Conference: Prior to installation of the waterproofing system, representatives of the following entities shall at the project site: Owner, Architect, Architect's waterproofing consultant, Contractor, Waterproofing Subcontractor, waterproofing manufacturer, and representatives of other trades or entities directly concerned with installation or performance of the waterproofing system.

1. Attendees shall review all pertinent details and specifications, note potential problems, and make changes, deletions, or additions in writing deemed necessary and approved by the Owner. Also included in discussion shall be: the nature and availability of the waterproofing system materials; regulatory requirements; warranty requirements; submittal requirements and submittal schedule; application scheduling; forecast weather conditions; proposed installation procedures; completed waterproofing system; and any additional items related to the total waterproofing system.
2. Where possible, attendees shall tour waterproofing areas and discuss conditions including slope of waterproofing, wall and penetration flashing details, drainage, and materials compatibility.
3. Discussion will be recorded by the Contractor, including agreement or disagreement on matters of significance. Matters in question and/or disagreements shall be resolved in writing before starting commencing any waterproofing installation. A copy of the recorded discussion will be furnished to all attendees by the Contractor.

I. Performance Requirements: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with physical requirements of CAN/CGSB-37.50, "Hot Applied, Rubberized Asphalt for Roofing and Waterproofing" as demonstrated by testing performed by an independent testing agency of manufacturer's current waterproofing formulations.

1.05 DELIVERY, HANDLING, AND STORAGE: Deliver materials in factory sealed and labeled packaging. Sequence deliveries to avoid delays, while minimizing on-site storage. Handle and store materials following each manufacturer's instructions, recommendations, and material safety data sheets. Protect from the construction operations related damage as well as damage from weather, excessive temperatures, and prolonged sunlight. Remove damaged material from site and dispose of in accordance with governing regulations. Do not double-stack pallets of membrane materials during shipping or storage. Protect mastic and adhesive from moisture, excessive temperatures, and sources of ignition. Provide cover, top, and all sides, for materials stored on site, allowing for adequate ventilation. Protect water-based primers from freezing.

1.06 PROJECT CONDITIONS:

A. Substrate Condition: Proceed with waterproofing application only when the substrate construction and preparation work is complete and in condition to receive the waterproofing.

B. Weather Conditions: Perform waterproofing application only when the existing and forecasted weather conditions are within the guidelines established by the manufacturer of the waterproofing materials. Do not proceed with waterproofing installation when ambient or substrate temperature is below 25°F (-4°C). Do not apply waterproofing materials to a damp or contaminated surface.

1.07 WARRANTIES: Conform to Section 01790 and following requirements.

A. Contractor Warranty: The Contractor and Waterproofing Subcontractor shall warrant the installation of the waterproofing system and flashing to be watertight for a period of 5 years. The Contractor shall make all repairs during the warranty period to maintain the waterproofing watertight and in conformance with the requirements specified without additional cost to the Owner. Without invalidating or voiding any portion of the warranty, the Owner and/or Contractor has the right, in the case of emergency at any time during the warranty period and without invalidating this warranty, to make any temporary repairs required to protect the building and the contents of the building from damage due to leakage through the installed waterproofing system.

B. Manufacturer Warranty: In addition to the Contractor's and Waterproofing Subcontractor's warranty, the waterproofing system manufacturer shall furnish to the Owner a 10 year waterproofing system warranty for the Work included in this Section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Products: Subject to compliance with the following requirements:

1. Bakor 790-11 manufactured by Bakor; Local representative: Bruce Silvers, Phone: 949-855-3365.
2. Tremproof 150 manufactured by Tremco; Local representative: Gus Pinon, Phone 562-795-7727.
3. Hydrotech 6125 manufactured by American Hydrotech: Local representative: Webb Baker, Phone 714-377-9599.

2.02 MEMBRANE: Single-component, 100% solids, hot-applied rubberized asphalt, complying with the following as determined by the test method indicated with each property:

A. Flash Point -- not less than 260°C or not less than 25°C above manufacturer's maximum recommended application temperature; ASTM D92 and CAN-CGSB - 37.50.
B. Cone Penetration -- 110 maximum at 25°C and 200 maximum at 50°C; ASTM D1191 and CAN/CGSB - 37.50.
C. Flow -- 3 mm maximum at 60°C; ASTM D1191 and CAN/CGSB - 37.50.
D. Toughness -- not less than 5.5 J; CAN/CGSB - 37.50.
E. Ratio of Toughness to Peak Load -- not less than 0.040; CAN/CGSB - 37.50.
F. Adhesion Rating -- Pass; CAN/CGSB - 37.50
G. Water-Vapor Permeance --1.7 ng/Pa x s x sq. m; ASTM E96, Procedure E and CAN/CGSB - 37.50.
H. Water Absorption -- 0.35-g maximum mass gain or 0.18-g maximum mass loss; CAN/CGSB - 37.50.
I. Pinholing -- not more than 1 pinhole; CAN/CGSB - 37.50.
J.. Low Temperature Flexibility -- no cracking; CAN/CGSB - 37.50.
K. Crack Bridging Capability -- no cracking, splitting, or loss of adhesion; CAN/CGSB - 37.50.
L. Heat Stability -- meet the requirements of CAN/CGSB - 37.50 for penetration, flow, low temperature flexibility, and viscosity when heated for 5 hours at material manufacturer's recommended application temperature.
M. Viscosity Test -- 2 to 15 seconds; CAN/CGSB - 37.50.
N. Water Resistance -- no delamination, blistering, emulsion, or deterioration after 5 days at 122°F (50°C).

2.03 FLASHING SHEET: For drains, upturns, prefabricated metal flange flashing, flashing sheet (100 mils) or modified bitumen sheet (160 mils).

2.04 AUXILIARY MATERIALS:

A. Primer: ASTM D41, asphaltic primer.

B. Sealants and Accessories: Waterproofing manufacturer's recommended sealants and accessories.

C. Vertical Transitions: Neoprene sheet flashing, 60 mil minimum, non-staining, uncured sheet neoprene with manufacturer's recommended contact adhesives.

1. Tensile Strength -- 1400 psi minimum; ASTM D412, Die C.
2. Elongation -- 300% minimum; ASTM D412.
3. Tear Resistance -- 125 psi minimum; ASTM D624, Die C.
4. Brittleness -- does not break at minus 30°F (minus 34°C); ASTM D2137.
5. Polyester Reinforcing Fabric -- waterproofing membrane manufacturer's recommended polyester fabric reinforcing.
6. Separator Sheet -- ASTM D4397, polyethylene sheet, 6 mils thick minimum.
7. Protection Sheet -- ASTM D5147, for sampling and testing modified bitumen roofing membranes, 80 mils thick.
8. Drainage Board -- as recommended by primary waterproofing system manufacturer.

2.05 MISCELLANEOUS MATERIALS:

A. Band Clamps: 1/2 inch wide stainless steel band clamp with slotted worm drive fastening mechanism.

B. Nailins: Steel nail with mushroom head in zinc body, Type 2, Class 3, 1/4 inch diameter, length to bed in substrate a minimum of 1-1/2 inches.

C. Screws: ASTM A304, stainless steel pan head screws with neoprene washers where heads are exposed.

D. Sealant (Polyurethane): ASTM C920, Grade NS, Class 25, one (Type S) or two (Type M) part polyurethane, non-sag, sealant. Color -- standard to blend with primary material at sealant line.

E. Termination Bars: Predrilled stainless steel termination bars, approximately 1 inch x 1/8 inch thick, anchor with nails (to masonry or concrete) or stainless steel screws (to wood or metal).

PART 3 - EXECUTION

3.01 CONCRETE SURFACE PREPARTION:

A. All concrete surfaces shall be cured a minimum of 14 days and dry. Concrete in vented metal pan decks must be cured a minimum of 60 days.
B. Concrete surfaces shall be a minimum wood float finish and uniform.
C. Before application of hot rubberized asphalt, substrate shall be clean, dry, free from surface water, dust, dirt, oil, grease, curing compounds, or any other foreign matter detrimental to the adhesion of the hot rubberized asphalt.
D. Any scaling or laitance on concrete shall be sandblasted off prior to waterproofing commencing.
E. Install all expansion joints and penetrations prior to waterproofing installation.
F. Apply primer uniformly at a rate of approximately 500 ft^2/gal., avoiding an excessive or overspraying application. Ponding of the primer is not permitted.
G. The primer shall be dry before applying the hot rubberized asphalt.
H. Perform calcium chloride moisture test. Furnish written documentation to waterproofing manufacturer for issuance of acceptance of substrate to Architect.

3.02 CONCRETE JOINT AND CRACK TREATMENT:

A. Prepare, treat, rout, and fill joints and cracks in substrate according to CAN/CGSB - 37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing", and waterproofing manufacturer's directions. Remove dust and dirt from joints and cracks per ASTM D4258 before coating surfaces.
B. At discontinuous deck-to-deck joints, bridge joints with neoprene flashing sheet extended a minimum of 6 inches on each side of joints and adhere to substrates in a layer of hot rubberized asphalt.

3.03 CONCRETE DECKS: For membrane reinforcement at sheet metal flashings, apply the hot rubberized asphalt membrane including reinforcement fabric over edge of horizontal flange at deck elevation.

3.04 MEMBRANE APPLICATION: Apply rubberized asphalt according to CAN/CGSB - 37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing" and manufacturer's installation directions.

A. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator, specifically designed for heating rubberized asphalt waterproofing.
B. Start application with manufacturer's technical representative present.
C. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
D. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to the heights indicated or required by manufacturer.
E. Reinforced membrane -- apply waterproofing to substrate and adjoining surfaces; spread hot rubberized asphalt to a thickness of 90 mils, fully embed membrane reinforcing fabric overlapped sheets 2 inches, and spread another 125 mil thick layer to provide a uniform reinforced seamless membrane 215 mils thick. Carry fully reinforced system to grade elevation.
F. Install separator course (6 mil Visqueen) over membrane.
G. Composite Drainage Board -- install the drainage board over separator course using the manufacturer's recommended composite drainage board. Install the drainage board in accordance with manufacturer's published installation criteria.

3.05 FLASHING INSTALLATION:

A. Install neoprene flashing sheets at the terminations of the waterproofing membrane in accordance with CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing", and waterproofing system manufacturer's written instructions.
B. Prime substrate with asphalt primer if required by waterproofing system manufacturer.
C. Set neoprene flashing sheets in a layer of hot, rubberized asphalt wherever possible, otherwise, set in bonding adhesive. Roll sheet membrane and seams with heavy hand roller promptly after installation to ensure complete bonding to substrates. Install the neoprene flashing sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.
D. Extend neoprene flashing sheet up parapet walls to elevations shown on the Drawings, and a minimum of 6 inches onto deck.
E. Mechanically fasten top of base flashing sheets with termination bars. Fasten termination bar 8 inches on center to concrete: Fasten with nails. Do not fasten with nails within 1-1/2 inches of the edges.
F. Flash single pipe and conduit penetrations with neoprene flashing sheets set in hot rubberized asphalt. Secure top of flashing sheet with stainless steel band clamp.

3.06 FLASHING AT DRAINS:

A. Area around drains shall be coated with hot rubberized asphalt membrane at a thickness of 1/8 inch.
B. Place flashing sheet over coated drain flange and extending 12 inches minimum around the flange.
C. Apply a second coat of hot rubberized asphalt membrane over the flashing sheet to 1/8 inch thickness.
D. Apply clamping ring exerting sufficient pressure to affect a seal between clamping ring and membrane.
E. Temporarily block drains during the application of ballast, or other materials that may block the drains. Remove blocking when work is in progress and upon completion.

3.07 PERIMETER EXPOSED MEMBRANE FLASHING: Using uncured neoprene flashing sheet and/or APP granule surfaced modified bitumen flashing sheet, embed flashing sheet in 1/8 inch thick layer of hot rubberized asphalt while still hot and tacky. Overlap a minimum of 3 inches on side lap.

3.08 PROTECTION AND CLEANING: Protect waterproofing according to manufacturer's recommendations to prevent damage and wear during application and remainder of construction period. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.09 WATER TEST: Contractor shall conduct a water test at each work area. Drains shall be plugged and water provided over the membrane for a 24 hour period. Any leaks shall be repaired by the Contractor in accordance with waterproofing material manufacturer's repair criteria. The area shall then be re-water-tested.

3.10 FINAL INSPECTION: Shall be conducted by the Architect with the Contractor, the Waterproofing Subcontractor, and material manufacturer. A single list of items to be completed shall be compiled by the Architect and forwarded to the Contractor, with a copy forwarded to the Owner. The Contractor shall complete all items within 10 workdays of receipt of list. Once items are completed, Contractor shall notify Architect that all items have been completed, in writing.

WATERPROOFING SUBCONTRACTOR 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 Manual, and Drawings.

Name of Subcontractor's Company:

Name of Principal in Subcontractor's Company:

Signature of Principal: Date:

END OF SECTION

SECTION 07160

CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide a cementitious type crystalline waterproofing treatment for concrete wall and floor surfaces within elevator pits, concrete pits to contain water, and for other surfaces as indicated, specified, and required.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit crystalline waterproofing manufacturer's technical data, preparation and application instructions, and recommended coverage rates.

B. Evidence: Submit written evidence that the Subcontractor for Work of this Section meets the qualifications specified below with list of previous projects successfully treated by the Subcontractor.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Supervision: Start application under supervision of the material manufacturer. Notify manufacturer at least 48 hours prior to starting application.

B. Subcontractor's Qualifications: Employ a Subcontractor for Work of this Section who is skilled and experienced in application of waterproofing of type required.

C. Preliminary Tests: Manufacturer and Subcontractor shall make tests on the concrete surfaces to be treated to establish actual application rates required and the required preparation and application procedures.

1.04 PRODUCT DELIVERY: Deliver material to site in containers bearing name and batch number of manufacturer, with seals intact.

1.05 PROTECTION: Do not allow the waterproofing material to contact materials damaged by the material. Cover and protect such surfaces with an impervious sheet material and remove when application is completed.

1.06 WARRANTY: Refer to Section 01790. The Contractor and Subcontractor shall jointly and severally warranty that treated concrete surfaces will be waterproof and remain free of water intrusion or leakage for two years and that they will immediately repair and correct any deficiencies or leaks that appear in treated surfaces during the warranty period at no cost to the Owner. Leaks caused by structural cracking or movement are excepted from the warranty.

PART 2 - PRODUCTS

2.01 WATERPROOFING MATERIAL: As manufactured by Xypex Chemical Corporation, of the cementitious crystalline type that chemically controls and permanently fixes an insoluble crystalline growth in capillary voids of concrete. Provide Xypex "Concentrate" plus "Dry-Pac" consistency for filling form tie holes, for sealing strips, and for structural defects. Provide Xypex "Modified" for a second coat where two coats are required, or in a mortar consistency for placement of a cove strip.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

3.02 PREPARATION: Conform to manufacturer's directions. Coordinate slab and wall finishing to assure correct surfaces.

3.03 APPLICATION: Employ experienced mechanics using the methods and equipment recommended by the manufacturer while concrete surfaces to be treated are moist. Treat and fill form tie holes, rock pockets, and concrete joints and finish all angles in walls and floors with a cove according to waterproofing manufacturer's instructions.

END OF SECTION

SECTION 07180

FLUID APPLIED ROOFING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. At Contractor's option, provide fluid applied roofing as specified herein in lieu of the built-up bituminous roofing specified in Section 07560, subject to conformance with requirements indicated and specified, and approval of the Architect.

A. Work Included:

1. The extent of roofing work consists of furnishing everything necessary for, and incidental to, the execution and completion of the fluid applied roof coating system, as indicated on the Drawings, specified herein, and in accordance with the Contract Documents.
2. Contractor shall coordinate with all other trades that directly influence fluid applied roofing system application, to provide a watertight installation of all roofing flashings.
3. Contractor shall verify condition of substrate, deck slope, curbs, penetrations, flashings, equipment supports, etc., and shall notify the Architect of any discrepancies in Work of this Section as shown on the Drawings and specified, prior to submission of bid.

B. Additional Work Included: Provide work of this Section wherever "Elastomeric Waterproofing" is shown on the Drawings, such as the slabs below gratings, in trench drains, and similar locations. Provide the systems as specified herein except the aggregate surfacing is not required.

1.02 SYSTEM DESCRIPTION: The fluid applied roofing shall consist of a minimum of an aggregate surfacing embedded into and covered over with separate top coat layers of single component, elastomeric polyurethane membrane. The surfacing and top coats shall be installed over not less than three liquid-applied elastomeric polyurethane base membrane layers. The base membrane shall be installed over the concrete substrate. The fluid applied roofing application shall result in a minimum 72 dry mil installed membrane thickness, exclusive of the aggregate. Color of new coating shall be pre-approved by the Architect.

A. Special Requirements: Conform to following requirements:

1. Rout all cracks over 1/16 inch wide and apply approved sealant by manufacturer after priming. Cracks with high movement, apply 60 mil neoprene sheet per manufacturer's installation criteria.
2. Apply additional stripe application consisting of 30 dry mil thick layer of elastomeric polyurethane membrane base coats over all cracks after sealant application. Stripe coat application shall also be installed over all hairline substrate cracks less than 1/16 inch wide.
3. Remove laitance or contaminants. Additional preparation work may be required to deck surface per material manufacturer's requirements. The material manufacturer shall furnish a letter of deck acceptance and approval of specified system for the Work.
4. Install sample area of the base coat, minimum 2 foot square, to determine proper that adhesion is obtained. Verify adhesion of system prior to installation of remainder of system.
5. Apply primer and a single component elastomeric, fire-rated, urethane roofing system by specified manufacturers. The fluid applied urethane roof system shall have a current Los Angeles Research Report number (LRR).
6. The fluid applied roofing material manufacturer shall furnish a letter of acceptance of the project conditions for proposed system.
7. Provide uncured non-staining neoprene sheet flashing or reinforcement fabric flashing at locations specified and in accordance with the manufacturer's installation criteria.
8. Provide accessories as required for complete watertight installation.
9. Apply a double surfacing application around entire perimeter of the roof, about 10 feet wide.

1.03 SUBMITTALS: Refer to Section 01330 for submittal procedures.

A. Product Data: Submit six copies of manufacturer's product specifications, installation instructions, and general recommendations for each principal roofing system product required.

B. Approved Applicator: Prior to the bid, submit manufacturer's certification for each roofing application and, before any roofing materials are delivered to the job site, submit a copy of a letter from roofing materials manufacturer stating that the Roofing Subcontractor is an approved applicator of the materials to be used in the application of the roofing system.

C. Drawings: Coordinate with the Architect, roofing manufacturer, and Contractor for clarification of any Drawings prepared by the Architect for all details not included among the Architectural Drawings which become necessary to reflect any proposed changes, substitutions, or clarifications to the Architectural Drawings.

D. Certificate: Contractor shall submit roofing material manufacturer's certification that all products used for the installation of the roofing system are to be totally free of asbestos fibers, even trace amounts.

E. Warranties: Submittal requirements upon completion of the Work.

1.04 QUALITY ASSURANCE:

A. Regulatory Requirements: Conform to regulations of public agencies having jurisdiction, including any specific requirements of the City and State of jurisdiction.

B. Products: Contractor shall provide primary products including waterproofing membrane, etc., produced by a single manufacturer and shall provide secondary products acceptable to manufacturer of primary products.

C. Manufacturer Participation: The Contractor shall arrange for the services of a representative of the roofing manufacturer for initial instructions in application of materials. The manufacturer shall supply such service as required at no additional cost to the Owner. The manufacturer's representative shall perform, as a minimum, two site visits per week and issue a letter of findings regarding installation procedures and overall acceptance of area visited.

D. Applicator Requirements: The Roofing Subcontractor shall have a minimum of 5 years experience in successfully applying the same or similar materials and shall be approved by the materials manufacturer.

1. Roofing Subcontractor shall be currently approved and licensed by the manufacturer of the fluid applied roofing materials to be used. Roofing Subcontractor shall employ use only skilled workers familiar with the products and manufacturer's current recommended installation methods.
2. Except as modified and supplemented herein, the Roofing Subcontractor shall follow the published requirements and written recommendations of the manufacturer of the fluid applied roofing system and other material manufacturers. Concerning methods of installation, industry practices apply only when this Section does not address the matter.
3. If, in the opinion of the Roofing Subcontractor, any work of this Section is indicated on Drawings or specified in such a manner as to make it impossible to produce warrantied work of the highest quality, or should discrepancies appear from one Drawing to another, or between the Drawings and this Section, the Contractor shall notify the Architect in writing for instruction or clarification before proceeding.

E. Pre-Roofing Conference: Prior to installation of the fluid applied roofing system, representatives of the following entities are required to meet at the project site: Owner, Architect, Architect's roofing consultant, Contractor, Roofing Subcontractor, roofing material manufacturer, and representatives of other entities directly concerned with installation or performance of the fluid applied roofing system.

1. Attendees shall review all pertinent details and requirements specified, note any potential problems and make any changes, deletions, or additions in writing as deemed necessary and approved by the Owner. Also included in the discussion shall be the following: Nature and availability of fluid applied roofing materials, warranties and submittal requirements, scheduling and forecast weather conditions, regulatory requirements, completed roofing system, proposed installation procedures and any additional items related to the total roofing system.
2. Where possible, attendees shall tour roofing areas and discuss conditions including roofing slope, wall and penetration flashing details, drainage, and materials compatibility.
3. Discussion will be recorded by the Contractor, including agreement or disagreement on matters of significance. Matters in question or disagreements shall be resolved in writing before commencing any work of this Section. A copy of recorded discussion shall be furnished to all attendees.

1.05 PRODUCT HANDLING: Inspect all delivered materials for conformance to requirements specified. Materials that are not approved or do not meet required standards shall be marked as rejected and permanently removed from the project job site on an immediate basis.

A. Delivery: Deliver all roofing system materials in original, unopened manufacturer labeled packages to locations(s) as directed by Contractor.

B. Storage: When stored outdoors, store all materials on pallets. Totally cover the materials stored outside using a breathable watertight covering. Extend covering down to the pallet so that no materials remain exposed, and properly secure to resist wind uplift. Visqueen or other non-breathable plastic coverings may be used at the Contractor's risk. Unprotected, moist, or otherwise damaged materials or materials with evidence of moisture damage shall be conspicuously marked for permanent removal from the project site.

C. Handling: Select and handle material and equipment to avoid damage to materials or applied roofing. Verify that all materials are protected before, during, and after arrival at the site. Verify that all materials have been adequately protected from moisture damage while in transit.

1.06 PROJECT CONDITIONS

A. Conditions: Construction may not be as shown on the Drawings and some modification of details or specified requirements may be required to accomplish intent of the Contract Documents. All such changes or revisions require the Owner's approval by means of an appropriate Modification. Contractor must receive such approval in writing from the Architect for all modifications or adjustments before commencing Work of this Section. Before starting fluid applied roofing, thoroughly examine all surfaces to be coated for deficiencies. If deficiencies exist, notify the Architect writing and the needed corrections shall be made prior to commencing work of this Section.

B. Environmental Requirements:

1. Do not proceed with application of materials when deck temperature is less than 40°F.
2. Do not apply roofing materials unless surface to receive coating is clean and dry, or if precipitation is imminent. If inclement weather is anticipated during working hours, take adequate precautions to ensure that roofing materials and applied roofing are protected from possible moisture damage or contamination.

C. Safety and Health Conditions: During coating application, it is essential that maximum effort is made to protect the coating mechanic and others near the workplace from breathing vapors and coming into contact of material with skin or eyes.

1. In confined areas, best form of protection against organic solvents or other potentially sensitizing vapors is a fresh air supply. For maximum protection, it is recommended to use a NIOSH/MSHA approved self-contained breathing apparatus with full-face piece used in positive pressure mode.
2, In unrestricted (open outdoor) areas, it is recommended to wear a suitable mask or respirator of a type approved by NIOSH/MSHA.
3. To prevent excessive skin contact with the material, it is recommended to use fabric coveralls and neoprene or other resistant gloves. To prevent eye contact, wear full-face mask or OSHA approved protective goggles.
4. Protection: Keep all products away from heat, sparks, and flames. Do not allow the use of spark producing equipment during application and until all vapors are gone. Post "No Smoking" signs.
5. The solvents from coating materials can carry considerable distances and care shall be taken to do the following:
   a. Post warning signs a minimum of 100 feet from the work area.
   b. Cover all intake vents near the work area.
   c. Minimize or exclude all personnel not directly involved with the coating application.
   d. Have CO_2 or other dry chemical fire extinguishers available the job site.
   e. Provide adequate ventilation.
   d. After completion of application, do not allow any traffic on coated surfaces until the coating material has cured and the protection course is in place.
   e. Remove debris daily from the roofing area and haul off site. Comply with the requirements of this Section.
   f. Immediately repair or replace damaged and/or defective work to the approval of Architect, Roofing Consultant and Contractor. Perform repair of damaged or defective work at no extra cost to the Owner.

1.07 WARRANTIES: Conform to Section 01790 and the following requirements.

A. Contractor Warranty: The Contractor and Roofing Subcontractor shall warrant the installation of roofing system and flashing to be and remain watertight for a period of 5 years. The Contractor shall make all repairs during this warranty period to maintain the roofing watertight and in conformance with the requirements specified, without additional cost to the Owner. Without invalidating or voiding any portion of this warranty, the Owner and Contractor have the right, in the case of emergency at any time during this warranty period and

without invalidating this warranty, to make temporary repairs that are required in order to protect the building and the contents of the building from damage due to leakage through the installed roofing system.

B. Roofing System Manufacturer Warranty: In addition to the Contractor's warranty, the roofing system manufacturer shall furnish to the Owner a 10 Year Warranty covering any and all repairs required to keep the roofing, including the field and flashings, watertight for 10 years.

PART 2 - PRODUCTS

2.01 GENERAL: This Section has been compiled on product performance criteria and not on system criteria. Evaluation of submittals will be solely based on a product comparison to the specified materials.

2.02 ACCEPTABLE MANUFACTURERS: coating of the acceptable manufacturer shall be the same balanced aromatic membrane throughout. Provide one of the following systems:

A. Jones Blair Co.: Neogard-Auto-Gard II Fluid Applied System
B. Tremco: Vulkem 350/351 Fluid Applied System

2.03 MATERIALS:

A. Fluid Applied Roofing Material:

1. Sealant Primer -- Neogard II VOC Compliant Primer or Vulkem 171, 181 or 191 for concrete, masonry, tile, wood, and metal flashings.
2. Membrane Base Coat Material -- Auto-Gard II Base Coat Material by Neogard, or Vulkem 350.
3. Membrane Top Coat Material -- Auto-Gard II Polyurethane Coating Material by Neogard, or Vulkem 351.
4. Liquid Flashing -- Neogard 7400 or 7420 Series, or Vulkem 450.
5. Bond Breaker -- Polyethylene self-adhesive tape, compatible with sealant for particular application to prevent three-sided adhesion and provide the proper geometry with the sealant.
6. Joint Backing: Provide closed cell type, neoprene, butyl, or polyethylene foam, free from oil or other staining elements. Joint backing material shall be compatible with sealant. Joint backing shall be under 25% to 30% compression.
7. Cleaning solvent shall be Xylene or Toluene. The installer must additionally certify the cleaners are acceptable with the manufacturer for specific products selected.
8. Reinforcing Fabric: As recommended and approved by the membrane material manufacturer.
9. Aggregate: Uniformly graded (20 - 40 mesh); hard aggregate having a minimum hardness of 6.5+ on Moh's scale or as approved by the material supplier.
10. Sealant:
    a. Sealant manufactured or approved in writing by fluid applied roofing material manufacturer.
    b. Sealant shall be multi-component polyurethane based conforming to ASTM C920-02, Type M, Grade NS or SL, Class 25, use NT and M; color determined by the coating manufacturer, subject to Architect's approval.
11. Flashing Sheet: Provide 60 mil uncured neoprene sheet by primary roofing material manufacturer.

2.04 FASTENERS: Fasteners such as nails, screws, bolts, etc., shall be of same materials as the flashings on which they are used. They shall be of type and size as shown on the Drawings or specified herein.

A. Sheet Metal to Sheet Metal: Self-tapping sheet metal screws of minimum 1/2 inch length and minimum #3 diameter.

B. Exposed Fasteners: Shall have 5/8 inch steel/neoprene washers under head.

PART 3 - EXECUTION

3.01 INSPECTION: Verify that surfaces to receive roofing are acceptable to roofing manufacturer.

A. Substrate surface is free of ridges, sharp projections and voids. Smooth substrate surfaces by grinding flush or applying sealant to create smooth conditions.
B. Evaluate the roofing after the base coat has been installed and has cured. Repair bubbles or deficiencies in the base coat or made visible by the base coat application over the substrate.

3.02 PREPARATION: Prior to installation of fluid applied roofing system, the Contractor shall inspect the substrate conditions and verify that the roofing system may be installed in strict accordance with original design,

the manufacturer's current recommendations, and all other pertinent codes and regulations. Commencement of the roofing application over any section will denote acceptability to the Contractor of that section and the Contractor will be responsible for work occasioned by having started over an unsatisfactory surface.

A. Surfaces to receive roofing membrane must be thoroughly clean, dry, and free of surface contaminates or cleaning residue which will interfere with the adhesion of the membrane.
B. Scarify substrate surfaces using shotblasting or other appropriate method, as determined by manufacturer requirements and project conditions.
C. All non-moving cracks in concrete shall be stripe-coated with 30 dry mils of base membrane coating for a distance of 2 inches on either side of the crack.
D. Apply a 3/4 inch fillet bead of sealant and a 2 inch face coat stripe of base membrane around all pipes, drains, and vertical junctions, including stairs.
E. Sealant expansion and contraction joints shall be cleaned, primed, fitted with a backing rod and caulked with elastomeric polyurethane sealants. Joints and all caulked cracks shall be stripe-coated with a 30 mil preparatory coat of base membrane.
F. Mask and protect all adjacent areas not to be coated.

3.03 FLASHING:

A. Required metal, neoprene, and fabric flashings shall be installed immediately after substrate preparation.
B. All metal shall be cleaned and primed prior to coating with the flashing adhesive or base membrane.
C. The base membrane is used as an adhesive and as a coating for the reinforcing fabric flashing material. The flashing tape shall be laid into the wet base membrane with roller, brush or broad blade knife. The fabric shall be laid relaxed, smooth and wrinkle-free.
D. Wet embedded tape shall be overcoated with base membrane extending at least 1 inch beyond fabric edge. Allow to cure overnight.
E. Flashing shall be coated (with base coat and top coats) each time deck is coated.

3.04 MEMBRANE INSTALLATION: Install the fluid applied roofing membrane in strict accordance with the manufacturer's specifications and these specifications.

A. Roofing applicator shall have sole right of access to the specified areas for the time needed to complete the application and affect an adequate cure.
B. Apply primer at a nominal rate of 1/3 gallon per 100 square feet. Within 8 hours of application of the primer, the base coat must be applied. If the base coat cannot be applied within 8 hours, then re-prime.
C. Base membrane shall be spray or squeegee applied in three (3) uniform coats over the properly prepared substrate at a nominal rate of 4 gallons per 100 square feet, or as needed in order to obtain a minimum thickness of 48 dry mils.
D. The wearing surface coat shall be applied at a nominal rate of 1 gallon (minimum) per 100 square feet in one (1) coat, or as needed in order to obtain a minimum thickness of 12 dry mils,
E. Immediately broadcast properly graded, evenly distributed, aggregate at a nominal rate of 15 lbs. per 100 square feet. When dry, remove excess aggregate and recoat the surface with coating material, with 1 gallon per 100 square feet to achieve a minimum thickness of 12 dry mils.
F. The minimum overall dry film thickness of the complete roofing system shall not be less than 72 mils (exclusive of aggregate).

3.05 PROTECTION:

A. The completed roofing membrane system shall not be subject to any pedestrian traffic. If the work of Roofing Subcontractor is not approved by the Contractor during the first four (4) days after application is complete, then there shall be no traffic of any type allowed until such acceptance and approval is given.
B. After completion, the fluid applied roofing membrane shall be adequately protected by the Contractor against damage, stain, or misuse by other trades until final acceptance of the work by the Owner.

3.06 CLEAN-UP: Conform to Section 01740 and following requirements.

A. Contractor shall remove all markings from finished surfaces. In areas where finished surfaces are soiled by membrane or any other source caused by Work of this Section, consult manufacturer of surfaces for cleaning advice and conform to instructions.
B. Contractor shall keep the premises clean and free from accumulations of waste materials and rubbish at all times, and shall remove all debris, scrap, and rubbish from the site daily.
C. Surplus materials and all equipment shall be promptly removed from the site upon completion of work of this Section.

3.07 FINAL INSPECTION: The Architect and Roofing Consultant, with the Contractor, shall inspect the entire completed roofing system, including membrane, flashings, etc. Any deficiencies or incomplete work items will be noted at this time and be documented. A punch list of all such items will be issued to the Contractor.

CONTRACTOR ROOFING CERTIFICATION

Project Name: ___

Building No./Address: ___ _____

General Contractor: _____

Date of Installation: _____

Roofing Manufacturer: _____

ROOFING CERTIFICATION

As the Fluid Applied Roofing Subcontractor on this project, I certify that the specified roofing system(s) have been installed in accordance with the manufacturer's published criteria, Project Manual, and the Drawings.

Name of subcontractor's Company: ____

Name of Principal in Subcontractor's Company: _____

Signature of Principal: ___ Date: _____

END OF SECTION

SECTION 07190

WATER REPELLENTS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide a water repellent sealer treatment, complete.

A. Work Included:
1. Inspection of surfaces.
2. Preliminary tests.
3. Water repellent sealer on following unpainted exterior surfaces:
   a. Concrete except walking surfaces, precast concrete, concrete unit masonry, and like porous exterior materials.
   b. Plaster.

B. Related Work:
1. Painting.
2. Waterproofing membranes of all types.

C. Definition: The term "waterproof" shall mean resistant to penetration of water from driving rain under normal weather conditions of the area.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Samples and Product Data: Submit Samples of sealer accompanied by sealer manufacturer's technical data, surface preparation and application instructions, recommended coverage rates for the types of surfaces to be treated, and evidence that sealer conforms to all requirements specified. With Product Data, include a calculation of the area of each type of surface to be treated and total number of gallons required to seal all surfaces to be treated.

B. Subcontractor: Submit written evidence that Subcontractor for the Work of this Section is skilled and experienced in sealer application of type required, with a list of previous projects successfully treated by the Subcontractor with sealer of the type specified.

C. Test Reports: Submit written test reports for preliminary testing, both manufacturer's laboratory testing and testing at the site.

D. Certificate and Summary Statement: Prior to completion of Work, submit a certificate signed by Subcontractor for Work of this Section attesting sealers applied conform to approved submittals and all requirements specified; in the certificate include a summary statement giving following information:

1. Number of square feet of each surface treated with sealer, classified as to the kind of material treated, open pore or closed pore type, and whether vertical or horizontal.
2. The number of gallons of each type, class, or grade of sealer required to treat all involved surfaces calculated on basis of number of square feet of each kind and orientation of material classified above and in accordance with results of preliminary tests specified below.
3. Total gallons of each sealer type, class, or grade actually applied.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Supervision: Start sealer application under supervision of the sealer manufacturer. Notify the Architect, Contractor, and sealer manufacturer at least 72 hours prior to starting preliminary tests and application.

B. Preliminary Tests:

1. Tests by Manufacturer: Send following test samples, all as approved for use in the Work under other Sections, to sealer manufacturer for preliminary laboratory testing to verify sealer is adequately reacted by material or product constituents and that sealer is compatible with and does not affect the color or appearance of the material or product. Deliver copies of manufacturer's test reports to Contractor. Furnish and deliver following test samples:

a. Cement plaster, six 12" square panels prepared on rigid backing of each color required.
b. Concrete masonry units, six each.

2. Preliminary Tests at Site: Sealer manufacturer and the Subcontractor for Work of this Section shall make tests on each kind of surface to be treated to establish the actual application rates required to fully waterproof involved surfaces and meet warranty requirements. Tests shall demonstrate sealer does not darken, mottle, or discolor treated surfaces and that surfaces to be treated are dry. Application rates established must not be less than those recommended in sealer manufacturer's technical data for the kind of material and orientation of surfaces. Perform site preliminary testing on approved sample walls if such are required under other Divisions; otherwise, perform the preliminary tests on designated surfaces of the building.

3. Preliminary Test Repeating: If surfaces to be treated with sealer are found to be soiled by dust, dirt, smog, fumes, or other deleterious substances, as evidenced by dirt or stain marks developing from sealer "run-down" during the preliminary site tests, Subcontractor shall high pressure water wash surfaces to receive the sealer until all such deleterious substances are entirely removed and shall allow the washed surfaces to fully dry. Preliminary tests at the site shall then be repeated as specified above.

C. Source Quality Control: From the sealer manufacturer's containers stored at the site (see Article "Product Delivery" hereinafter), the Contractor will designate a container to be opened by Subcontractor and the Contractor assisted in obtaining a 1-quart sample of sealer in a glass container furnished by the Contractor, for record purposes. Contractor may elect to have sample tested by the Testing Laboratory; refer to Section 01450.

1.04 PRODUCT DELIVERY: Deliver all sealer materials to site in containers bearing name and batch number of manufacturer, with container seals intact. Deliver all sealer required for the Work at one time.

1.05 PROJECT/SITE CONDITIONS:

A. Protection: Install temporary coverings and protection, and do not allow any sealer to contact plastic, planting soil, plants, asphaltic paving, roofing membranes, or other materials damaged by sealer.

B. Weather Conditions: Do not apply sealer during windy, wet, or excessively hot or dry weather conditions.

1.06 WARRANTY: Refer to Section 01790. The Subcontractor shall warrant that all repellent sealer treated surfaces will remain waterproof and free of water intrusion for at least 2 years, and that it will immediately repair and correct deficiencies or leaks that appear in the treated surfaces during warranty period at no cost to the Contractor. Sealer manufacturer shall warrant to furnish all sealer materials required to correct leakage that occurs in the water repellent treated surfaces within 5 years from the Date of Substantial Completion at no further cost to the Contractor. Leakage caused by structural cracking or movement are excepted from the warranty.

PART 2 - PRODUCTS

2.01 SEALER MATERIALS: Furnish sealer materials conforming to the requirements as specified herein, "Deep Seal" manufactured by Pacific Coatings and Chemicals, 10040 Canoga Avenue, Chatsworth, Calif. 91311, 818/407-0224, or "Enviroseal 40" by Hydrozo; refer to Section 01630 regarding substitutions. Dilution of sealer at the site is not allowed. Provide a clear non-silicone non-acrylic wax-free sealer of organo-silane polymer

solids and a water-base solvent, type that does not darken or discolor treated surfaces and non-toxic, compatible with standard product polymer type calking and sealing materials, meeting AQMD requirements, and certified by the sealer manufacturer as containing not less than 20% organo-silane solids by weight and suitable to receive oil, alkyd, or water based paint finish.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710. Report to Contractor in writing all conditions which interfere with or prevent correct application of Work of this Section. Do not proceed with application in affected areas until the adverse conditions are eliminated or corrected.

3.02 PREPARATION: Verify that surfaces to receive sealer are clean and free of dust, dirt, oil, grease, other deleterious substances and stains, and laitance or efflorescence; conform to Subparagraph "Preliminary Test Repeating" herein as required. Repair cracks or holes over 1/16" size. Spot prime cracks and holes 1/16" size and smaller and prime all horizontal surfaces other than soffits with heavy duty organo-silane sealer supplied by same sealer manufacturer. Mask and fully protect adjoining surfaces and glass unless sealer is harmless and easily removed.

3.03 APPLICATION: By experienced mechanics using methods and spray equipment recommended by sealer manufacturer (Hudson type sprayers are not permitted) and when surfaces to be treated are dry determined by moisture meter in accordance with sealer manufacturer's instructions.

A. Application Rates: Apply sealer in one or more coats as required, in the quantity of sealer, number of coats, and coverage rates per coat established by preliminary tests except total quantity not less than the rate recommended for the involved surface in manufacturer's technical data.

B. Spray Application: Apply each sealer coat by airless spray using nominal 20 psi nozzle pressure. Obtain complete coverage of each coat. Indicate to the Contractor or Inspector areas that are coated when application is stopped for lunch or at end of the day.

3.04 CLEANING-UP: Conform to Section 01740. Removal surplus materials, tools, equipment, containers, waste, and protection materials from the site. Leave all treated surfaces and adjoining Work clean and free of damage or soiling that may result from Work of this Section.

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide batt and board type thermal and sound building insulation, complete.

A. Work Included:
1. Thermal batt insulation for exterior building walls and under roof decks.
2. Sound insulation in interior partitions and on ceilings.
3. Rigid insulation behind spandrel and other glasses in exterior openings.
4. Electrical outlet box pads.

B. Related Work: Insulation for mechanical systems.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Submit the insulation and prong anchor manufacturers' printed specifications and instructions. For acoustical insulation, submit the following:

A. Materials list of items proposed to be provided under this Section.
B. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
C. 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.

1.03 PRODUCT DELIVERY AND STORAGE:

A. Insulation: Deliver in factory wrappings or cartons, labeled as to the contents. Store in ventilated and dry areas within the enclosed building.

B. Note: For the batt insulation on exterior walls of tenant areas, deliver batts as specified above, but store needed quantity in each tenant area and leave for tenant installation.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Thermal Batt Insulation: Conforming to ASTM C665-98, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing, Type III, Class A, minimum thermal resistance in exterior walls and under roof decks as indicated, batts with flanges for use under roof decks, friction-fit batts for use in metal framing. If batts are totally enclosed with fire-resistive construction, as approved by Code, batts may have a Class B or Class C facing.

B. Sound Insulation: Friction fit type incombustible fibrous glass batts or blankets, minimum thickness equal to stud depth to entirely fill the void space, nominal 0.70 to 2.50 pcf density, flame spread of 25 or less, smoke developed of 50 or less per ASTM E84 test. Furnish unfaced type batts and blankets equal to OCF unfaced "Noise Barrier Batts" for plenum insulation and "Friction Fit Building Insulation". Perform acoustical insulation to the approval of the Acoustical Consultant, but make no change in the scope of the Work without specific written approval from the Architect.

C. Rigid Insulation: Owens Corning Series 700 Fiberglass Insulation, density for rigid non-sagging installation behind glazing in exterior openings as indicated, one-piece sizes unless otherwise approved.

D. Spindle Anchors: Stic-Klip Mfg. Co., Type A or B as required, with Type S adhesive; Miracle Adhesives Corp. "Miracle StukUps" with Type HT994 adhesive; Goodloe E. Moore Gemco or Tuff-Weld with G-P Improved

or Tuff-Bond Quik-Set Type Adhesive as applicable; or equal. Use adhesives of correct type for substrates and type of anchor.

E. Staples: Stainless steel, monel, or copper-coated steel, size directed by batt manufacturer or required by Code.

F. String Wires: Minimum 18 gage galvanized steel wire.

G. Electrical Outlet Box Pads: For all types of electrical and communication outlet boxes in located sound insulated walls and partitions, provide "Lowry's Outlet Box Pads" by Harry A Lowry & Associates, 213/875-0223, "Sound Pad #68" by L.H. Dottie Co. (213) 269-3161, or equal, sizes and types as required.

PART 3 - EXECUTION

3.01 INSTALLATION OF BATTS: Install batts with close fit, free of gaps, holes, or sagging. Maintain nominal 3/4" air space between the insulation and interior wall or ceiling finish. Supplement the installation with wire ties, adhesive, spindle anchors, or staples where required to prevent sagging. Provide spindle anchors where shown or necessary in accordance with manufacturer's instructions, including required setting time, spaced at maximum 12" centers both ways.

A. Batts In Metal Framing: Provide friction-fit batts tightly fitted to stud webs and to metal furring.

B. Batts Under Concrete and/or Metal Decking Roof Decks: Install foil-faced flanged-type insulation batts secured with prong anchors. Staple flanges together at maximum 4" centers and seal joints at abutting vertical surfaces with a pressure-sensitive plastic tape. Provide 18 gage galvanized string wires under batts wherever necessary to prevent sagging, stretched taut.

C. Rigid Insulation: Install as shown behind exterior glazing. Secure around the perimeter. Do not use adhesive to secure to glass.

3.02 SOUND INSULATED PARTITIONS: Install sound insulation continuously between studs from the finish floor to top of wall. Snugly fit all sound insulation in place free of gaps or holes. Install outlet box pads at electrical type outlet boxes in sound insulated walls; plug unused knock-outs in boxes with knock-out caps before installing pads.

END OF SECTION

SECTION 07560

BUILT-UP BITUMINOUS ROOFING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide built-up bituminous roofing as indicated and specified, complete.

A. Work Included:

1. The extent of the built-up roofing system work is indicated on the Drawings and by requirements of this Section and supporting Detail Drawings, and includes roofing, composition flashing, stripping, and roofing accessories integrally related to roofing installation.
2. Contractor shall coordinate all trades that directly influence the roof system application, to provide a watertight installation of all roof flashings.
3. Contractor shall verify condition of substrate, deck slope, curbs, penetrations, flashings, equipment supports, etc., and shall notify the Architect of any discrepancies in Work as shown on Drawings prior to submission of bid.

1.02 SYSTEM DESCRIPTION: The new roof system shall be a built-up roof assembly consisting of a mineral surfaced fiberglass cap sheet over three plies of Type IV fiberglass felt, each set into independent applications of hot asphalt (Type III) over a venting fiberglass base sheet. The base sheet shall be partially adhered to the building's primed structural concrete deck with the initial ply set into a hot asphalt application.

A. New roof system shall be as classified by Underwriters' Laboratories, Inc. (UL) as a Class A assembly.
B. The new roof system shall be attached in compliance with the Factory Mutual System (FM) wind uplift resistance Classification I-90.
C. Phasing of Surfacing Application: Specified base sheet and interply felt roofing system shall be installed with the surfacing being delayed until a majority of the roof related work of other trades is completed.
   1. Prior to the surfacing application, Contractor and Roofing Material Manufacturer shall inspect the roof membrane interply system and record all areas which require repair, including items which may have been caused by other trades.
   2. Include in phasing any and all surface preparation required to apply the flood coat of hot asphalt and mineral surfaced cap sheet.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit roofing material manufacturer's Product Data sheets for each product to be used in the installation of the specified roofing assembly, including rolled goods, fasteners, primer, and mastics. Include data substantiating that materials comply with specified requirements, including bitumen criteria for softening point, flash point, equiviscous temperature (EVT), and finished blowing temperature. This certification shall be obtained and submitted prior to commencement of application. Submittals shall include:
   1. Roofing material manufacturer's general installation guidelines and flashing installation guidelines for the specified roofing assembly.
   2. Submit roofing material manufacturer's roof system attachment requirements for compliance with Factory Mutual I-90 wind uplift resistance requirements.

B. Qualification Letter: Before any membrane roofing materials are delivered to the job site, submit a copy of the letter from the roofing materials manufacturer stating that the Roofing Subcontractor is an approved applicator of the materials to be used in the application of the roof system.

C. Shop Drawings: Submit for all flashing and sheet metal details not included among the Architectural Drawings and to reflect any proposed changes or substitutions to the Architectural Drawings; identify each proposed change or substitution shown as a "deviation" in the Shop Drawings as specified in Section 01330.

D. Letter of Acceptance: Submit a copy of a letter from the roofing material manufacturer which stipulates the roofing material manufacturer's of deck acceptance along with detail compliance for issuance of warranty.

1.04 QUALITY ASSURANCE:

A. Regulatory Requirements: Conform to regulations of governing public agencies, including any specific requirements of the City and State of jurisdiction.

B. The roof system shall be classified by Underwriters' Laboratories, Inc. (UL) - Class A materials.

C. Material Quality: Contractor shall provide primary products, including each type of roofing membrane, produced by a single manufacturer which has been producing these types of products successfully for not less than 5 years; provide only secondary products which are acceptable to the manufacturer of primary products.

D. Experience: Roofing Subcontractor shall have a minimum of 5 years experience in successfully applying the same or similar materials, and shall be approved by the material manufacturer.

E. Quality Standards: Contractor and Roofing Subcontractor shall complete all Work of this Section in accordance with the requirements of the current California Building Code as adopted or amended by the local building department, the material manufacturer's published general installation requirements, and industry standards. Industry standards for roofing are as established by the National Roofing Contractors Association's Fifth Edition Manual, with standards for sheet metal components established by the latest manual from the Sheet Metal and Air Conditioning Contractors National Association. In event of a conflict with requirements specified and Drawings with the above, the more stringent requirement shall prevail.

F. Applicator Requirements: Roofing Subcontractor shall be currently approved and licensed by the manufacturer of the roofing materials to be used. Employ skilled roofers completely familiar with the products and the manufacturer's current recommended methods of installation.

G Installation Procedures: Except as modified and supplemented herein, follow published requirements and written recommendations of the manufacturer of the roof system materials and other material manufacturers. Concerning methods of installation, industry practices apply only when this Section does not address the matter.

H. Discrepancies: If, in the opinion of the Contractor, any roofing work is indicated on Drawings or is specified in such a manner as to make it impossible to produce work of highest quality, or should discrepancies appear from one Drawing to another or between Drawings and requirements specified, notify the Architect before proceeding.

I. Pre-Roofing Conference: Before installation of the roofing system, representatives of following entities shall meet at the project site: Owner, Architect, Roofing Consultant, Contractor, Roofing Subcontractor, and representatives of other entities directly concerned with installation or performance of the roofing system, including, but not limited to, plumber, electrician, mechanical, etc.

1. Attendees shall review all pertinent details and specified requirements, noting potential problems and making changes, deletions, or additions as deemed necessary, all subject to approval of the Owner. Also included in the discussion shall be the following: nature and availability of roofing materials; warranty; submittal requirements; scheduling; forecast weather conditions; regulatory requirements; protection of building, building components and completed roof system; proposed installation procedures; and any additional items related to the total roof system.
2. Where possible, attendees shall tour the roofing areas and discuss general roof deck conditions, including roof slope, curb and penetration flashing details, drainage, and material compatibility.
3. Discussion will be recorded by the Contractor, including agreement or disagreement on significant matters. If meeting ends with substantial disagreements, it shall be determined how disagreements will be resolved and a date will be set for a reconvened meeting. A copy of recorded discussion will be furnished to all attendees by the Contractor.

1.05 PRODUCT HANDLING: Deliver roof system materials in original manufacturer labeled packages with bitumen bills of lading showing manufacturer, bitumen softening point, EVT, finished blowing temperature and flash point with each delivery. All roofing products shall bear Underwriters' Laboratories Inc. (UL) labels.

A. Storage: When stored outdoors, store rolled materials on end and on pallets. Totally cover materials stored outside using a breathable watertight covering. Extend covering down to the pallet so that no materials remain exposed and properly secure to resist wind uplift. Use of Visqueen of other non-breathable plastic coverings will be at the Contractor's sole risk. Unprotected, moist, or otherwise damaged materials or materials with evidence of moisture damage, such as staining, shall be conspicuously marked for permanent removal from the job site. Handle rolled goods with care to prevent damage to edges or ends. Storage of materials shall not block any entryways. I. Verify that all materials are protected before, during, and after arrival at the job site. Verify that all materials have been adequately protected from moisture damage while in transit.

B. Inspection: Inspect all delivered materials for conformance to requirements specified. Materials found that are not approved or do not meet requirements and standards shall be marked as rejected and permanently removed from the job site.

C. Equipment: Select and handle material handling equipment to avoid damage to materials or applied roofing.

D. Heating Bitumen: Use only kettles and/or tankers that have automatic thermostats to control the bitumen temperature, and also have accurate thermometers that are clean and easy to read. Do not allow bitumen to be heated above the finished blowing temperature. In the event that asphalt is heated above the finished blowing temperature, discontinue application until the asphalt is allowed to cool to an acceptable temperature. Asphalt that is heated above the finished blowing temperature beyond four hours shall be discarded and not used for the built-up roof system.

E. Loads: Do not load or permit any part of a structure to be loaded with a weight that will endanger its safety or cause damage.

1.06 PROJECT CONDITIONS:

A. Environmental Requirements:

1. If inclement weather is anticipated during the work period, take adequate precautions to ensure that materials, applied roofing, and building interior are protected from possible moisture damage or contamination.
2. Wind velocity limitation shall be based on ability to apply materials in specified manner.
3. Special precautions are required when ambient temperature is below 40°F.

B. Protection:

1. Protect building contents and grounds during the process of the Work. Protect all paving, walls of building, and buildings adjacent to hoist, kettle, and stinger pipe prior to starting work. Windows, doorways, docks, walkways, etc., may require special protection measures.
2. Remove all debris daily from the roof and haul off site.
3. Furnish 15 pound minimum size fire extinguishers using ammonium phosphate fire fighting agent. Locate two at each kettle or tanker, and two at site of hot bitumen application on the roof.
4. Provide special protection of avoid heavy traffic on completed roofing when ambient temperature exceeds 80°F.
5. Contractor must take every precaution to prevent interior leakage, materials from falling into the interior, or other such occurrences. Installation of materials shall be accomplished in such manner hat bitumen drippage does not occur.
6. In the event of damage, immediately repair or replace all damaged and/or defective work to the approval of the Architect.

1.07 WARRANTIES: Conform to Section 01790 and the following.

A. Contractor Warranty: The Contractor shall warranty the roofing and flashing installation to be watertight for a period of 5 years. The Contractor shall make all repairs during this period to maintain the roof watertight and in conformance with the requirements specified without additional cost to the Owner. At the end of the warranty period, the Contractor, at Owner's option, with the Consultant and a representative of the Owner, shall conduct a final roof inspection. All blisters, bubbles, bare spots, and other defects shall be repaired by the Contractor at its own expense. The Owner has the right, in the case of emergency at any time during this period and without invalidating this warranty, to make any temporary repairs that are required in order to protect the building and the contents of the building from damage due to the roof leaking.

B. Manufacturer Warranty: Before the Work is accepted and final payment can be made, furnish to the Owner a written, No Dollar Limit (NDL) warranty, transferable to any owner of the building, covering any and all repairs required to keep the roof, including the roof field and flashings, watertight for a period of 10 years beginning at the time of the Owner's final acceptance of the Work.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS: All the membrane roofing materials shall be manufactured by the one of the following approved manufacturers: GAF or Malarkey.

2.02 SHEET MATERIALS:

A. Vented Base Sheet (for Non-nailable Structural Concrete Areas): Stratavent (Perforated) by GAF or ESHAvent by Malarkey.

B. Glass Fiber Felt: Fiberglass mat coated with premium asphalt, meeting ASTM D2178, Type IV - Gafglas Ply 4 by GAF or #500 by Malarkey (also to be used as reinforcing plies in base flashings.)

C. Woven Glass Fabric: ASTM D1668, Type I.

D. Mineral Surfaced Fiberglass Cap Sheet: Asphalt coated fiberglass mat with mineral surfaced cap sheet, meeting ASTM D3909 - Gafglas Mineral Surfaced Cap Sheet by GAF or #502 Premium Fiberglass Base Sheet by Malarkey (to be used as surfacing ply in base flashings.)

E. Base Flashing Assembly: Base flashings shall consist of a minimum (2) plies of Type IV fiberglass roofing felts and a mineral surfaced fiberglass cap sheet, or a smooth SBS modified bitumen sheet with a mineral surfaced cap sheet (no SBS surfacing sheets).

2.03 BITUMINOUS MATERIALS:

A. Asphalt Bitumen: ASTM D312, Type III, Trumbull Industries.

B. Asphalt Primer: ASTM D41 as manufactured by the primary material manufacturer.

C. Flashing Grade Modified Roof Cement: ASTM D4586, Type I and ASTM D3409. Jetblack Flashing Cement by GAF or as manufactured or approved in writing by the primary material manufacturer.

D. Emulsified Aluminum Coating: Henry 229 Aluminum Emulsion complying with Fed Spec TT-P-320D, Type II, Class 3 for aluminum pigment, or as manufactured by the primary material manufacturer.

2.04 CANT STRIPS AND INSULATION CRICKETS

A. At Vertical Junctures: Nominal 4 inch x 4 inch preformed fiberboard cant strip, ASTM C208-95(2001), as manufactured or approved in writing by the primary material manufacturer.

B. Crickets: Pre-tapered perlite roof insulation conforming to Fed Spec HH-I-529b, as manufactured or approved in writing by the primary material manufacturer. Installed insulation crickets shall provide a minimum 1/4 inch per foot of slope in designated area on the roof plan.

2.05 FASTENERS:

A. Base Flashing to Wood Members/Plywood: A 12 gauge ring shank or annular threaded nail fabricated from carbon steel with a 1 inch diameter head, a minimum of 1.25 inches long, as manufactured by Simplex Nails Inc.

B. Base Flashing to Concrete: A 9 gauge fluted shank masonry nail with 1 inch diameter head, a minimum 1 inch long, as manufactured by Simplex Nails Inc.

2.06 SURFACING:

A. Mineral Surfaced Fiberglass Cap Sheet: Asphalt coated fiberglass mat with mineral surfaced cap sheet, meeting ASTM D3909 - Gafglas Mineral Surfaced Cap Sheet by GAF or #502 Premium Fiberglass Base Sheet by Malarkey (to be used as surfacing ply in base flashings.)

2.07 MISCELLANEOUS:

A. Elastomeric Sealant: Low modulus, high performance, one-part polyurethane conforming to Fed Spec TT-S-00230C, Type II, Class A, such as Mameco Vulkem 921 or Sikaflex-15LM.

B. Roof Protection Material: A 1/2 inch thick granular surfaced asphaltic pad, a minimum 3 foot by 5 foot in dimension, as manufactured by APOC or otherwise approved by the primary material manufacturer.

C. One-way Moisture Vents: Aluminum vents, as manufactured by the primary material manufacturer or GAF.

PART 3 - EXECUTION

3.01 ROOF PREPARATION: Prior to installation of new roofing, Roofing Subcontractor shall inspect the existing roof conditions and verify that the new roof system may be installed in strict accordance with original design, the manufacturer's current recommendations, and warranty requirements, and all pertinent codes and regulations. Any irregular areas of substrate shall be brought to the attention of the Contractor for correction prior to the start of work.

A. Commencement of roofing application over any section will denote acceptability by the Contractor and Roofing Subcontractor of that section, and they will be responsible for any corrective work occasioned by having started over an unsatisfactory surface.
B. Clean all surfaces of debris, and any moisture before proceeding with application of new roof system.

3.02 CANT STRIP INSTALLATION: Install cant strip at vertical-to-horizontal membrane transitions at walls, curbs, and platforms. Cant strip shall be neatly mitered in corners. Hand breaking of cant strip for corners will not be permitted. Fiberboard cant strip shall be set into place in a bed of elastomeric roof cement or asphalt directly over the primed concrete substrate prior to the base sheet and membrane installation.

3.03 BASE SHEET INSTALLATION: Install vented base sheet over non-nailable structural concrete deck in the following manner:

A. Apply asphaltic primer at 1 gallon per 100 square feet by roller and allow to thoroughly dry.
B. Install venting base sheet per material manufacturer's installation guidelines. Base sheet shall be lapped 2 inches for GAF's Stratavent and 3 inches for Malarkey's ESHAvent with 6 inch end laps.
C. Extend venting base sheet up vertical face of parapet wall to provide for perimeter venting.

3.04 INSULATION INSTALLATION: Over the installed base sheet, install tapered insulation crickets in areas identified on the Drawings.

A. Install each insulation panel independently in 30 pounds per 100 square foot application of hot asphalt applied directly over base sheet.
B. Lay all insulation boards to moderate contact without forcing joints. Cut boards to fit neatly to perimeter and around protrusions through the roof. Any joint over 3/8 inch wide shall be filled with insulation.
C. Broken corners or damaged board shall be cut out and replaced with newly cut insulation pieces.
D. Insulation shall not be left exposed to the weather. No more insulation shall be applied than can be completely covered with the finished roof system on the same day.

3.05 MEMBRANE INSTALLATION:

A. Felt Plies: Install three plies of manufacturer's Type IV fiberglass roofing felt over the installed venting base sheet in the following manner:

1. Starting at the low point of the roof, apply one 18 inches wide strip, then over that ply install full 36 inches wide Type IV fiberglass roofing felt. Apply following plies full width, overlapping the preceding felt by 19 inches in such a manner that at least three plies of felt cover the base sheet at any point.

2. All layers of roofing shall be laid free of wrinkles, creases or fishmouths. Plies shall be laid at right angles to slope of the deck except where slopes exceed 1 inch per foot. Felts shall be laid directly behind asphalt applicator. Sufficient pressure shall be exerted on the roll during application to ensure prevention of air pockets.
3. Provide one-way relief vents within the roof membrane field supplementing perimeter venting per material manufacturer's requirements.

B. Guidelines: Adhere to the following guidelines:

1. Lightly broom each ply of felt in place, full width, while the bitumen is hot and fluid. Felts shall lay flat and fully bonded, in a manner that in no area shall felt touch felt. Use only a squeegee or conduit type broom.
2. Valleys and waterways shall receive an additional ply of fiberglass felt, at least 36 inches wide. This ply shall be installed over the base sheet prior to the membrane application.
3. Roofing materials shall not be installed during inclement weather.
   a. Roofing materials shall not be applied when moisture in any form, such as dew, can be seen or felt on the surface to which those materials are to be applied.
   b. Materials shall not be applied when foaming, blistering, or bubbling of hot bitumen occurs.
4. Interply moppings of hot (at EVT) asphalt shall be continuous and applied at a nominal rate of 25 pounds per square. Application methods shall insure that all plies are completely embedded in asphalt. Interply bitumen shall be steep asphalt, Type III, 190°F softening point.
5. Temperatures at the kettle shall be controlled so bitumen temperature shall not exceed the asphalt manufacturer's maximum finished blowing temperature.
6. All exposed base sheet and insulation (crickets) must be covered with completed roof membrane system at the end of each day's work, with the exception of the surfacing sheet. Roof terminations and openings shall be watersealed.

7. Staging of the roof membrane application or temporary membrane is not acceptable. Membrane shall be installed in final form on a daily basis.
   a. If phased roofing occurs as a result of emergency conditions, install additional plies over the phased areas so that a continuous three (3) ply system is installed.
8. Provide thermostatic controls and visible thermometer on the tanker and/or kettle, maintained in working order and calibrated.
9. Keep foot and wheeled traffic off the newly installed membrane until asphalt has sufficiently cured to prevent displacement voids.
10. Repair membrane deficiencies such as voids, bridging, fishmouths, cuts, tears, etc., in acceptable manner. Incorporate into such repairs as many plies as are affected by the deficiency.
11. Air void pockets, determined by the test samples, shall not exceed 8% per interply mopping for individual sample; average of all samples shall be less than 5% per interply mopping. If corrective action is required, cut the roofing felts down to the void and cover with three (3) plies of fiberglass felt set into hot asphalt applied at a nominal rate of 25 pounds per 100 square feet.

C. Surfacing:

1. Cap Sheet Surfacing: Starting at the low point, apply one (1) layer of cap sheet, being sure to maintain 2 inch side laps and 6 inch end laps over the preceding sheets. Cut 12 foot to 18 foot lengths of cap sheet and flop into a full width mopping of hot bitumen applied at a nominal rate of 30 pounds per 100 square feet. Temperature of the asphalt, when applied, shall be such that, when the cap sheet is set into it, its temperature is approximately 20°F above the EVT. Cap sheet must be firmly and uniformly set into the bitumen with all edges well sealed.

   a. Loose granules shall be carried throughout the cap sheet application, to be broadcast over excess bitumen seepage, spillage, etc., in order to maintain aesthetic quality of cap sheet.
   c. Apply emulsion and granules over any low spots identified during final inspection by Roofing Consultant.

2. Install walkpad material at roof hatch (minimum 3 sections), around all mechanical equipment and as shown on Drawings. Walk pad material shall be installed over completed cap sheet and adhered with five 2" in diameter applications of roof cement (one in each corner and at the center of each section).

D. Bitumen Heating Requirements: As follows:

1. Maximum asphalt temperature in heating equipment:
   a. Asphalt shall not be heated to the minimum flash point.
   b. The minimum finished blowing temperature shall not be exceeded for more than a total of 4 hours, for any asphalt batch or portion thereof.
   c. Remove from the project any asphalts heated above these limits.
2. Temperature at time and point of application:
   a. Asphalts to be within 25°F of their equiviscous temperature when applied in the roof system.
   b. Asphalts not meeting this criteria are to be reheated or allowed to cool, as required.

3.06 FLASHING INSTALLATION:

A. General Flashing Specifications: All flashing must be completed daily; however, base flashing surfacing may be delayed so long as fiberglass reinforcing plies are properly set into a solid mopping of asphalt as specified below.

1. Apply all other flashing not specifically detailed herein in accordance with roofing manufacturer's specifications.
2. All sheet metal that will come in contact with bituminous materials shall be primed with asphaltic primer and allowed to dry before applying bitumen.

B. Install flashings at vertical wall and curb surfaces that abut the built-up roof in the following manner:

1. Prime concrete and metal surfaces with asphaltic primer applied at a nominal rate of 1 gallon per 100 square feet, and allow to dry prior to applying bitumen.
2. Embed not less than two (2) plies of fiberglass felt into a solid mopping of hot steep asphalt over junctures, extending from the top of the curb or platform or 10 inches to 12 inches up the parapet wall, and down to a point at least 2 inches and 4 inches, respectively, past the toe of the cant strip onto the roof.

3. Over the preceding ply, apply the fiberglass cap sheet membrane per the roofing manufacturer's specifications. The flashing membrane shall be of sufficient width to extend from the top of the curb or platform surface or 10 inches to 12 inches up the parapet wall surface to a minimum of 6 inches past the toe of cant strip, onto the roof, or 2 inches further onto the roof than preceding ply.
4. Fasten the top edge of the base flashing approximately every 6 inches on center with appropriate fasteners through 1 inch diameter metal discs.
5. Seal corners and top edge of base flashings with woven fiberglass flashing fabric (4 inches wide) embedded into and covered over with flashing grade roof cement, centered over the top edge of the base flashings.
6. Completely bond all flashings to the underlying surface without any looseness, bubbles or voids. Remove and replace any loose flashings.
7. A minimum of 30 days after completion of project, all exposed roof cement is to be surfaced with an emulsified aluminum coating.
8. Alternate base flashing system consisting of a smooth SBS modified bitumen sheet and a mineral surfaced fiberglass cap sheet may be used.

C. Flash Flanged Metal Components: Flanges of lead and galvanized sheet metal flashings shall be primed and stripped-in with two plies of fiberglass roofing felt embedded into hot asphalt. The first ply shall extend a minimum of 3 inches beyond the flange onto the roof. The second ply shall extend a minimum of 3 inches further onto the roof than the first ply. After the cap sheet application, seal the cut edge of the cap sheet using a three-course application of woven glass fabric embedded into and covered over with flashing grade roof cement.

D. Installation of Lead Sheet at Drains: Embed the primed lead flashing sheet into a solid coating of roof cement over the installed field plies. Strip-in the lead flashing using two plies of fiberglass felt set into hot asphalt. Stripping plies shall extend beyond the lead flashing sheet 3 inches and 6 inches, respectively. Field plies, lead sheet, stripping plies, and surfacing sheet shall all extend under drain clamping ring. Install clamping rings immediately after installation of stripping plies and surfacing sheet.

3.07 CLEAN-UP: Conform to Section 01740 and following requirements.

A. Remove bituminous markings from finished surfaces. In areas where the finished surfaces are soiled by bitumen or any other source, caused by work of this Section, consult manufacturer of surfaces for cleaning advice and conform to instructions.

B. Contractor shall keep the roof and premises clean and free from accumulations of waste materials and rubbish at all times. Remove all debris, scrap, and rubbish from the work area daily. Do not throw or drop material from the roof; use fixed chutes to slide materials, or other means approved by the Architect, to prevent injury or damage to personnel, equipment, building, or premises.

C. Promptly remove surplus materials and equipment from the site upon completion of the work. In case of undue delay or dispute, Owner may remove rubbish, materials, and equipment and charge cost to Contractor, with such action permissible by Owner 48 hours after a written notice has been transmitted to Contractor.

3.08 FINAL INSPECTION:

A. The Owner, Architect, Roofing Consultant, and Contractor shall inspect the entire completed roof system, including surfacing, membrane, flashings, metal components, etc. Any deficiencies or incomplete work items will be noted at this time and documented. A punch list of all such items will be issued to the Contractor.

B. It is the Contractor's responsibility to verify and certify that all punch list items have been completed to the Architect's satisfaction.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide flashing and sheet metal items, complete.

A. Work Included:

1. Sheet metal flashings in connection with roofing.
2. Miscellaneous metal flashing and counterflashing as required, except where provided by the mechanical and electrical trades.
3. Coping caps.
4. Pitch pockets.
5. Sheet metal louvers with bird screens.
6. Drip flashings.
7. Building separation joint flashings.
8. Shop priming and field touch-up.
9. Calking.

B. Related Work:

1. Sheet metal flashings in connection with plumbing, air conditioning, and electrical.
2. Aluminum louvers - refer to Section 10210.
3. Metal accessories for drywall, lathing, and acoustical treatments.
4. Finish painting.
5. Sleeves for embedded items.
6. Steel decking.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Submit Shop Drawings for fabricated sheet metal showing details, methods of joining, anchoring and fastening, thicknesses and gages of metals, concealed reinforcement, expansion joint details, sections, and profiles. Submit such Product Data and Samples for materials or assemblies as Architect may request.

1.03 QUALITY ASSURANCE: Drawings and requirements specified govern. Conform to the current "Architectural Sheet Metal Manual" published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) for conditions not indicated or specified and for general fabrication of sheet metal items.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS:

A. Galvanized Steel: ASTM A653 with coating G90, mill phosphatized for paint adhesion, 24 gage unless otherwise shown or specified.

B. Solder: ASTM B32, type required for welding conditions.

C. Solder Flux: Standard brand non-corrosive acid-base type.

D. Fasteners: Zinc or cadmium coated steel or stainless steel.

E. Felt: ASTM D226, No. 15.

F. Primer: Galvanized metal primer approved for use under Section 09900 with primer manufacturer's pretreatment materials.

G. Sealant: Conforming to Section 07920.

2.03 GENERAL FABRICATION REQUIREMENTS: Fabricate items to avoid distortion and overstressing of fastenings due to expansion and contraction. Provide expansion joints where necessary in continuous runs of sheet metal, constructed watertight and spaced 30-feet apart maximum. Lock and solder corners and blind hem exposed edges. Make joints with 4" lap and solder unless otherwise shown or specified. Fill single lock seams with sealant where soldering is infeasible. Run flanges 4" minimum onto roof and wall surfaces. Fabricate sheet metal items in nominal 8-foot lengths unless otherwise shown or specified.

A. Soldering: Do soldering slowly immediately after application of flux, all seams showing evenly flowed solder. Clean and neutralize finished soldering.

B. Shop Priming: Clean completed items, apply pretreatment, and prime all exposed surfaces with specified primer.

2.04 FABRICATED ITEMS: Of 24 gage galvanized steel unless otherwise indicated or specified.

A. Coping Caps: Corner units having maximum 18" long legs and joints locked and soldered watertight, intermediate joints spaced at maximum 8-foot centers and equally spaced. Make intermediate joints of the flush butted type, edges spaced about 1/4" apart and centered over an 8" long backing plate of the same profile and gage as the cap, set in a 1/2" wide bead of sealant. Secure both edges of caps with 1-1/2" wide 20 gage galvanized steel cleats spaced at maximum 32" centers and locked into drip hem.

B. Sheet Metal Wall Louvers: Of minimum 18 gage galvanized steel, blades formed into stormproof profile, riveted, and soldered. Blind reinforce frame corners and solder watertight. Provide bird screens having 26 gage galvanized steel folded frames securely clamping 1/2" mesh 18 gauge galvanized hardware cloth, secured with screws.

C. Drip Flashings: Hemmed exposed edges, 1-piece lengths.

D. Pitch Pockets: Of 20 gage galvanized, sides doubled, joints locked and soldered watertight.

E. Flashings - General: Blind hem all exposed sheet metal edges.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS: Install sheet metal items as indicated, according to the approved submittals, and as required to complete the entire Work. Securely fasten and assemble, and make watertight and weathertight.

A. Coordination: Coordinate sheet metal items in connection with roofing for correct installation, and furnish in time to avoid delay in roofing construction. Install roofing sheet metal simultaneously with roofing.

B. Calking: Provide sealant calking as indicated and as required to seal and complete Work of this Section. Conform to Section 07920.

C. Isolation: Isolate sheet metal from contact with concrete or masonry with one layer of roofing felt or, where shown, vinyl underlayment, except embedded items. Conceal all isolation in the finished Work.

3.02 COMPLETION: Examine installed sheet metal items, water test if necessary or directed, and correct damaged or defective items.

END OF SECTION

SECTION 07700

ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide roof accessories as indicated and specified. Finish painting is specified in Section 09900.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit manufacturer's data for Work of this Section unless waived by Architect.

B. Shop Drawings: Submit detailing installation and attachment of Work of this Section.

PART 2 - PRODUCTS

2.01 REGLETS AND COUNTERFLASHINGS: Fry Reglet Corp. flashing systems complete with unions and preformed corners of necessary types for particular locations, of minimum 24 gage galvanized steel, or approved equivalents by Metco Metal Products Co., Pacific Loxtite Flashing Co., National Cornice Works, Redco, Lane-Air, or equal. Use a single manufacturer's products, equivalent to Type CO at concrete, Type MA at masonry, Type ST at plaster, or Type SM, as required by Drawings and details.

2.02 ROOF HATCH: Single leaf type unit having 12" high curb with integral deck flange and integral cap flashing of the same metal and gage, welded corners, and insulated with 1" thick fibrous glass rigid insulation; cover of minimum 14 gage aluminum with minimum 3" beaded flange, neatly welded and insulated with 1" thick fiber glass rigid insulation; insulation covered with a 22 gage aluminum liner; complete with zinc-coated hardware including heavy pintle hinges, enclosed counter-balancing and hold-open mechanism, a snap latch with turn handles, padlock lugs inside and outside, and neoprene or equal draft seals. Include safety post as standard with hatch manufacturer, spring loaded and moving easily up and down, complete with balancing mechanism. Roof hatch shall be aluminum type manufactured by Bilco, with Bilco Ladder-Up unit, or equal by Dur-Red, or Babcock-Davis.

PART 3 - EXECUTION

3.01 INSTALLATION: Conform to approved submittals and each manufacturer's recommendations.

END OF SECTION

SECTION 07810

CEMENTITIOUS FIREPROOFING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide cementitious type spray-applied fireproofing, complete.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit the following:

1. Fireproofing manufacturer's specifications for materials, preparation and spray application instructions.
2. Copies of Code, UL, and ICBO approvals for the material to be used.
3. Copies of certified laboratory test reports of tests performed on the material to be used for the following properties, tests performed in accordance with the standards referenced for the material properties: Bond strength and bond impact; compressive strength; deflection; air erosion and high speed air erosion; corrosion resistance; abrasion resistance; and impact penetration.
4. Include a list of all types and sizes of steel shapes to receive sprayed cementitious fireproofing, with the exact primer (where applicable) and exact fireproofing material to be applied to each type of steel shape involved as selected from and referenced to attached ES Report ER-4607 by the ICBO Evaluation Service, Inc., as Reissued February 1, 2002.

B. Applicator Qualifications: Submit evidence that the sprayed fireproofing applicator is approved by the material manufacturer.

C. Certificates: Upon completion, inspect sprayed fireproofing and submit a written certification that installed materials and workmanship conform to the requirements specified and Code. In addition, submit the inspection certificate required under Article "Field Quality Control" below.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements: Products, execution and fireproofing thicknesses shall conform to Code for the fire-resistance ratings indicated or required. Material and application shall conform to the OSHA regulation 29 CFR, Section 1926.55 governing asbestos in construction and be free of mineral wool.

B. Qualifications of Applicator: Work of this Section shall be performed by an applicator approved by the sprayed fireproofing material manufacturer.

1.04 PRODUCT HANDLING: Deliver fireproofing materials to the site in original factory containers bearing the manufacturer's name, identification, UL approval label, and date verifying material is current. Store in a dry place until used. Do not use material from bags which have been wet.

1.05 PROJECT/SITE CONDITIONS: Install temporary coverings and protection to prevent sprayed material from contaminating adjoining surfaces and construction and to prevent damage or creation of a public nuisance. Conform to requirements of governing public authorities. Post signs warning of slippery walking areas.

PART 2 - PRODUCTS

2.01 MATERIAL: Cementitious type fireproofing, certified by the manufacturer as conforming to Federal, State, and local laws and regulations and the following:

A. Manufacture: Monokote MK-6, MK-6/CBF, or MK-6/HY by the Construction Products Division of W.R. Grace & Co. establish intended type and quality. Equivalent products approved as substitutions, such as A/D Fire Protection Systems Type 7, may be used if meeting requirements herein and are approved as a substitution. Refer to Section 01630 for substitution requirements

B. Properties: Material shall meet following requirements.

1. Minimum average dry field density, measured per ASTM E605, listed in UL Fire Resistance Directory, ICBO Evaluation Report, or as required by governing Building Department, but minimum average 15 pcf whichever is greater.
2. Deflection strength and properties such that cracking or delamination from substrate does not occur per ASTM E759 test.
3. Bond impact strength and properties such that cracking or delamination from substrate does not occur per ASTM E760 test.
4. Minimum average bond strength of 200 psf, with minimum individual bond strength of 150 psf, per ASTM E736 test.
5. Air erosion not exceeding 0.005 gram psf per ASTM E859 test, performed on an "as applied" surface with no pre-purging, total reported weight loss being total weight loss over 24 hours from beginning of test.
6. Fireproofing exposed in air plenums or ducts shall exhibit no continued erosion after 4 hours exposure to 2500 fpm air speed, test performed according to the UMC-85, Appendix A, Section 10.116, and ASTM E859.
7. Compressive strength such that maximum 10% deformation occurs under a 1,200 psf compressive force per ASTM E761 test.
8. Corrosion not promoted on fireproofed steel per ASTM E937 test.
9. Abrasion resistance such that not more than 15 cc abraded or removed from fireproofing.
10. Loss shall not exceed 6 cc per impact penetration test.
11. UL listed 0 flame spread and 0 smoke development per ASTM E84 test.
12. Resistant to mold growth after inoculation with aspergillis niger and mixed spore cultures when tested according to Tappi T487-M54 and ASTM G21, mold inhibitor added by the fireproofing manufacturer.
13. Fireproofing shall have maximum 20MJ/m^2 total heat release 600 seconds after insertion per ASTM E1354 test at radiant heat flux of 75kW/m^2 Cementitious Fireproofing using electric spark ignition, test sample in horizontal position.
14. Material shall be tested and reported by UL according to ASTM E119 and be listed in current UL Fire Resistance Directory.

C. Mixing Water: Clean, from domestic potable source of adequate capacity.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to the Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until the adverse conditions are eliminated or corrected. Adverse conditions include oil, grease, primer, paint, loose mill scale, dirt, and other contaminants on substrates to receive fireproofing.

3.02 PREPARATION: Clips, hangers, support sleeves, and other attachments which penetrate the fireproofing shall be in place. Ducts, piping and other suspended Work which would interfere with fireproofing application shall not be installed until fireproofing is in place. Concrete on steel decking and roofing shall be in place. Concrete to be fireproofed shall be treated with a primer supplied by the sprayed fireproofing manufacturer.

3.03 APPLICATION: Conform fireproofing material mixing and application to manufacturer's instructions, and to UL and ICBO ER-4607 approvals. Thicknesses indicated are solely for review purposes but are minimum thicknesses allowed; increase the thicknesses as required for fire resistance ratings meeting Code requirements

based on material actually installed, at no extra cost to the Owner. Install temporary gage pins or like gaging devices to assure correct thickness at all locations.

A. Coordination: Coordinate application with adjoining Work. Apply material before ducts, pipes, boxes, conduits, and similar items are installed and after the hangers, supports, and steel framing for such items are secured to the steel members.

B. Defective Work: Fireproofing that becomes loose or is damaged during the construction of the Work shall be corrected.

3.04 FIELD QUALITY CONTROL: Before fireproofing is applied, Testing Laboratory shall inspect condition of substrates and issue a report of required corrections to the Architect. Upon completion of installation, Testing Laboratory shall inspect fireproofing and furnish to the Architect and Owner a certificate attesting to correct material, thickness, and coverage of fireproofing material for fire resistance ratings required in accordance with UBC Standard 7-6 and ASTM E605. The certificate shall include the following information and such other information as the Owner or Architect may require:

A. Application conforms to manufacturer's instructions.
B. Condition of substrate (condition of the protected member.
C. Thickness on columns, beams, and floors complies.
D. Density of the material.

3.05 ATTACHMENT: Attached to and made a part of this Section 07810 is a copy of ES Report ER-4607 issued by the ICBO Evaluation Service, Inc., Reissued February 1, 2002, Pages 1-17.

END OF SECTION

ES REPORT™

ER-4607

Reissued February 1, 2002

ICBO Evaluation Service, Inc. • 5360 Workman Mill Road, Whittier, California 90601 • www.icboes.org

Filing Category: FIRE-RESISTIVE CONSTRUCTION—Other Fire-resistive Construction

MONOKOTE® FIREPROOFING MATERIALS

W. R. GRACE & CO.
CONSTRUCTION PRODUCTS DIVISION
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CAMBRIDGE, MASSACHUSETTS 02140-1692

1.0 SUBJECT

Monokote® MK-6/HY, MK-6/HY Extended Set (MK-6/HY ES), MK-6s and Retro-Guard® RG Standard Density Cementitious Fireproofing Materials; Monokote® Z-106, Z-106/HY and Z-106/G Medium Density Cementitious Fireproofing Materials; and Monokote® Z-146 High Density Cementitious Fireproofing Material.

2.0 DESCRIPTION

2.1 General:

Monokote MK-6/HY, MK-6/HY ES, MK-6s, Z-106, Z-106/HY, Z-106/G, Z-146 and Retro-Guard RG direct-to-steel fireproofing materials are mill-mixed cementitious materials that are machine-applied for fire-resistive protection of structural framing members, concrete pan joists and steel floor or roof sections in all types of construction. The fireproofing materials have a Class I (1997 *Uniform Building Code*™ [UBC]) or Class A (2000 *International Building Code*® [IBC]) flame-spread classification and a smoke-developed rating of 50 or less when tested in accordance with UBC Standard 8-1 and ASTM E 84. The fireproofing materials are permitted to be used within plenums.

MK-6/HY, MK-6/HY ES, MK-6s, Z106, Z-106/HY, Z-106/G, and Z-146 are used for new construction. Retro-Guard RG is used for retrofit spray applications, and turns to light blue when dry. Z-146 may be used on weather-exposure surfaces as defined in UBC Section 224 or IBC Section 2502.

W. R. Grace & Co. Spatterkote SK-3 is a mill-mixed cementitious material applied as a primer to galvanized steel floor or roof metal decks, as specified in Tables 2 through 8 of this report.

W. R. Grace & Co. Monokote Accelerator may be added to MK-6/HY, MK-6/HY ES, MK-6s, RG, Z106, Z-106/HY and Z-106/G to a maximum percentage of 5 percent by weight, as a field-application aid.

Firebond Bonding Agent and Firebond Concentrate are manufactured by Fiberlock Technologies, Inc., and are bonding agents used when applying injected Z-106/HY to bare structural steel shapes or when applying fireproofing materials to wide-flange structural steel shapes having an unknown primed or painted surface in accordance with Section 2.3.5 of this report. The Firebond material is applied at a minimum rate of 500 square feet per gallon (12.2 m^2/L) when diluted 1:1 with water, or at 1000 square feet per gallon (24.4 m^2/L) when applied at full strength.

2.2 Mixing and Densities:

MK6/HY, MK-6/HY ES, MK-6s and Retro-Guard RG are supplied in bags and mixed with approximately 9 gallons (34 L) of water per 48 pounds (21.8 kg) of material. Monokote Z-106, Z-106/HY, and Z-106/G are supplied in bags and mixed with approximately 6 gallons (22.7 L) of water per 43 pounds (19.5 kg) of material. Monokote Z-146 is supplied in bags and is mixed with approximately 4 gallons (15.1 L) of water per 49 pounds (22.2 kg) of material.

These materials have setting characteristics and must be applied promptly after mixing. Clean equipment must be used.

The materials are mixed in a plaster mixer and then machine-applied through a nozzle, with air pressure and volume adjusted to provide the proper spray pattern. Application is achieved by application of one or more coats, and patching may be done by hand. The in-place density required for the fireproofing materials is shown in Table 1.

In-place density must be verified by the method prescribed in UBC Standard 7-6 (UBC) or ASTM E 605 (IBC).

2.3 Application:

2.3.1 General: Steel surfaces that are to be protected must be free from substances that may prevent good adhesion. The materials must be applied to the thickness specified in Tables 2 through 8 of this report, as applicable.

2.3.2 Application to Galvanized Steel Floor and Roof Units: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106/G, Z-106 and uninjected Z-106/HY may be sprayed directly onto galvanized steel fluted floor units. When applying MK-6/HY, MK-6s, MK-6/HY ES, Z-106/G and RG, all roof units without concrete topping and all cellular (flat) portions of galvanized metal decks must first be primed with an application of Spatterkote SK-3. The SK-3 application should result in an evenly distributed spattered surface, leaving 10 to 30 percent of all deck surface exposed. Over-spray onto other surfaces is allowed, but is not required. The SK-3 thickness constitutes part of the fireproofing thickness. The material is mixed in accordance with the manufacturer's instructions.

When applying Z-106 or injected or uninjected Z-106/HY, all cellular (flat) portions of galvanized metal decks must be lathed with 2.5-pound-per-square-yard (0.95 kg/m^2), diamond-mesh, $^3/_8$-inch (9.5 mm), expanded metal lath, which must comply with ASTM C 847.

When applying Z-146, all cellular and fluted portions of galvanized metal decks must be lathed with 2.5-pound-per-square-yard (0.95 kg/m^2), diamond-mesh, $^3/_8$-inch (9.5 mm), expanded metal lath, which must comply with ASTM C 847.

Electrical trench headers require the use of steel studs and disks when protected with cementitious fireproofing materials.

2.3.3 Application to Bare Structural Steel Shapes: MK-6/HY, MK6/HY ES, MK-6s, RG, Z-106, Z-106/G and Z-146 may be sprayed directly onto bare structural steel shapes. Injected Z-106/HY must be applied only with Firebond bonding agent.

2.3.4 Application to Primed or Painted Structural Steel Shapes: Under the following conditions, MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106, Z-106/HY and Z-106/G may be applied to wide-flange structural steel shapes having an unknown primed or painted surface:

1. Beam flange width does not exceed 12 inches (305 mm).
2. Column flange width does not exceed 16 inches (406 mm).
3. Beam or column web depth does not exceed 16 inches (406 mm).
4. Bond tests of five specimens in accordance with ASTM E 736 verify the bond strength of the fire-protection material bonded to a painted or primed $^1/_8$-inch-thick (3.2 mm) steel substrate.

Under the following conditions, Z-146 may be applied to wide-flange structural steel shapes having an unknown primed or painted surface:

1. Beam flange width does not exceed 18 inches (457 mm).
2. Column flange width does not exceed 18 inches (457 mm).
3. Beam or column web depth does not exceed 36 inches (914 mm).
4. Bond tests of five specimens in accordance with ASTM E 736 verify the bond strength of the fire-protection material bonded to a painted or primed $^1/_8$-inch-thick (3.2 mm) steel substrate.

Condition of Acceptance: That the average bond strength is 20 times the weight of the in-place fire-protection material but not less than 150 psf (7182 Pa), or that the average bond strength is 80 percent, with a minimum individual bond strength of 50 percent of the bond strength of fire-protection material applied to clean, bare, $^1/_8$-inch-thick (3.2 mm) steel plate, whichever is greater. Where bond strength values are less than these minimums, Firebond adhesive or another acceptable bonding agent is applied to the primed or painted surfaces, and the bond strength tests are repeated.

Any dimension limits exceeding the maximum values in condition 1, 2, or 3 of this section (Section 2.3.4) require a mechanical break, consisting of one or more minimum 1.7-pound-per-square-yard (0.65 kg/m^2) metal lath strips, or No. 20 SWG galvanized hexagonal wire mesh mechanically fastened to the flange or web either by weld, screw or power-actuated fastener. Fasteners are spaced a maximum of 12 inches (305 mm) on center, on each longitudinal edge of the strip, so that the clear spans do not exceed the limits established in condition 1, 2 or 3. At least 25 percent of the width of the oversize flange or web element shall be covered by the metal lath. Minimum metal lath width must be $3^1/_2$ inches (89 mm).

Monokote MK-6/HY, MK-6/HY ES, MK-6s, Z-106, Z-106/HY, Z-146 and Retro-Guard RG may be applied directly to painted or primed joists or girders without the use of mechanical breaks.

2.3.5 Protective Covering: Structural steel members less than 8 feet (2438 mm) from a floor, landing, or occupied space, and columns or vertical members to a height of 8 feet (2438 mm), shall be protected with Monokote Z-146 at the required thickness, or the exposed material must be protected with either furred wallboard, concrete or cement plaster with lath.

2.3.6 Thickness Tolerance: The thickness tolerances for fire-protection materials are as shown in Sections 2.3.6.1 and 2.3.6.2.

2.3.6.1 Minus Tolerance: The thickness must be corrected by applying additional material where the calculated average thickness is less than that required by the recognized design, or where an individual measured thickness reading has a minus tolerance greater than $^1/_4$ inch (6.4 mm), or more than 25 percent for a design thickness of less than 1 inch (25.4 mm).

2.3.6.2 Positive Tolerance: An individual measured thickness that exceeds the thickness specified in a design by $^1/_4$ inch (6.4 mm) or more must be recorded as the thickness specified in the design plus $^1/_4$ inch (6.4 mm).

2.4 Identification:

The fireproofing materials are furnished in bags bearing the W. R. Grace name, the manufacturing location, the product name, the evaluation report number (ICBO ES ER-4607), and the Underwriters Laboratories Inc. classification marking.

3.0 EVIDENCE SUBMITTED

Data and reports of fire-endurance tests in accordance with the ICBO ES Acceptance Criteria for Spray-applied Fire-protection Materials (AC23), dated April 2001.

4.0 FINDINGS

That the Monokote® and Retro-Guard® cementitious fireproofing materials described in this report comply with the 1997 *Uniform Building Code*™ (UBC) and the 2000 *International Building Code*® (IBC), subject to the following conditions:

4.1 Material application complies with this report and the manufacturer's instructions.

4.2 Exposed beams, columns and ceilings less than 8 feet (2438 mm) above the floor are protected in accordance with Section 2.3.5 of this report.

4.3 Measuring methods in UBC Standard 7-6 (UBC) or ASTM E 605 and ASTM E 736 (IBC) are used to verify thickness, density and bond strength of the fire-protection materials. When thicknesses are averaged and reported as a single measurement, each thickness measurement before averaging must be the thickness listed in this report plus or minus $^1/_4$ inch (6.4 mm) for averaging purposes only.

4.4 The PCI manual "Design for Fire-resistance of Precast Prestressed Concrete," recognized in evaluation report ER-3264, is applicable.

4.5 Special inspection performed by a qualified person approved by the building official is required as set forth in UBC Section 1701 or IBC Section 1704.11.

This report is subject to re-examination in one year.

TABLE 1—IN-PLACE DRY DENSITY REQUIRED FOR FIREPROOFING MATERIALS

MATERIAL DESIGNATION	IN-PLACE DENSITY (pcf)	
	Minimum Average	Individual Density
MK-6/HY, MK-6/HY ES and RG	15	14
MK-6s	19	18
Z-106, Z-106/HY and Z-106/G	22	19
Z-146	40	36

For SI: 1 pcf = 16.018 kg/m^3.

TABLE 2—MINIMUM AVERAGE THICKNESS OF FIRE-PROTECTION MATERIALS APPLIED TO STEEL COLUMNS[1]

A. Wide flange steel columns: Minimum thickness (inches)[2]:

A1. Fire protection material: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106/G

MINIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
6.62	5/8	3/8	3/8	1/8
2.49	1 1/4	7/8	5/8	3/8
1.44	1 7/8	1 1/2	1	1/2
0.83	2 1/2	1 3/4	1 1/8	3/4
0.67	2 3/4	2	1 3/8	3/4
0.57	3 3/8	2 1/2	1 3/4	7/8
0.33	3 7/8	2 1/2	2	1 1/8

A2. Fire protection material: Z-106, Z-106/HY

MINIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
6.62	5/8	3/8	1/4	1/4
2.49	1 1/4	7/8	5/8	3/8
1.44	1 7/8	1 1/2	1	1/2
0.83	2 1/2	1 3/4	1 1/8	3/4
0.67	2 3/4	2	1 3/8	3/4
0.57	3	2 1/2	1 5/8	7/8
0.33	3 7/8	2 1/2	2	1 1/8

A3. Fire protection material: Z-146

MINIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
6.62	5/8	3/8	3/8	1/4
2.49	1 1/4	7/8	5/8	3/8
1.44	1 7/8	1 3/4	1 1/8	3/4
0.83	2	1 5/8	1	3/4
0.67	2 1/2	2	1 3/8	3/4
0.57	3	2 1/4	1 5/8	7/8
0.33	3	2 1/4	1 3/4	1 1/8

B. Hollow shape steel columns: Minimum thickness (inches)[3]:

B1. Fire protection materials: MK-6/HY, MK-6/HY ES, MK-6s , RG, Z-106, Z-106/HY, Z-106/G

STEEL TUBE: SIZE (inches)	A/P RATIO	4 HR.	3 HR.	2 HR.	1 HR.
3 × 3 × 3/16	0.18	NR[5]	3 5/8	2 3/8	1
4 × 4 × 3/16	0.18	NR[5]	3 5/8	2 3/8	1
4 × 4 × 1/4	0.23	3 3/4	2 3/4	1 3/4	7/8
4 × 4 × 5/16	0.29	3	2 1/4	1 1/2	5/8
4 × 4 × 3/8	0.34	2 5/8	1 7/8	1 1/4	5/8
4 × 4 × 1/2	0.44	2	1 1/2	1	1/2+
STEEL PIPE: SIZE (inches)	**A/P RATIO**	**4 HR.**	**3 HR.**	**2 HR.**	**1 HR.**
3 dia. × 0.216 Standard	0.20	NR[5]	3 1/8	2 1/8	1
4 dia. × 0.237 Standard	0.22	3 7/8	2 7/8	1 7/8	7/8
4 dia. × 0.337 Extra Strong	0.31	2 3/4	2 1/8	1 3/8	5/8
4 dia. × 0.674 Double Extra Strong	0.56	1 1/2	1 1/8	3/4	3/8+
5 dia. × 0.258 Standard	0.24	3 1/2	2 5/8	1 3/4	3/4
6 dia. × 0.280 Standard	0.27	3 1/4	2 3/8	1 5/8	3/4
8 dia. × 0.322 Standard	0.31	2 7/8	2 1/8	1 3/8	5/8
10 dia. × 0.365 Standard	0.35	2 1/2	1 7/8	1 1/4	5/8
12 dia. × 0.375 Standard	0.36	2 3/8	1 3/4	1 1/8	1/2+

B2. Hollow shape steel columns: Minimum thickness (inches)[4]
Fire protection material: Z-146

STEEL TUBE: SIZE (inches)	A/P RATIO	4 HR.	3 HR.	2 HR.	1 HR.
3 × 3 × 3/16	0.18	3 3/8	2 5/8	1 7/8	1
4 × 4 × 3/16	0.18	3 3/8	2 5/8	1 7/8	1
4 × 4 × 1/4	0.23	3 3/8	2 5/8	1 7/8	7/8
4 × 4 × 5/16	0.29	3	2 1/4	1 1/2	5/8
4 × 4 × 3/8	0.34	2 5/8	1 7/8	1 1/4	5/8
4 × 4 × 1/2	0.44	2	1 1/2	1	1/2
STEEL PIPE: SIZE (inches)	**A/P RATIO**	**4 HR.**	**3 HR.**	**2 HR.**	**1 HR.**
3 dia. × 0.216 Standard	0.20	3 3/8	2 5/8	1 7/8	1
4 dia. × 0.237 Standard	0.22	3 1/2	2 5/8	1 7/8	7/8
4 dia. × 0.337 Extra Strong	0.31	2 7/8	2 1/8	1 3/8	5/8
4 dia. × 0.674 Double Extra Strong	0.56	1 5/8	1 1/4	3/4	3/8
5 dia. × 0.258 Standard	0.24	3 1/2	2 5/8	1 3/4	3/4
6 dia. × 0.280 Standard	0.27	3 1/4	2 3/8	1 5/8	3/4
8 dia. × 0.322 Standard	0.31	2 7/8	2 1/8	1 3/8	5/8
10 dia. × 0.365 Standard	0.35	2 1/2	1 7/8	1 1/4	5/8
12 dia. × 0.375 Standard	0.36	2 1/2	1 7/8	1 1/4	5/8

For **SI:** 1 inch = 25.4 mm.

+ Increase protection thickness by 1/16 inch for Z-106/HY to the nearest 1/8 inch.

[1]Fire-resistive protection is applied directly to exposed column contour or column boxed with metal lath.

[2]As an alternate to Table 2A, thickness of fireproofing may be determined on the basis of the following equation:

$h = R/[1.05(W/D) + 0.61]$

where:
R = Fire resistance (hours).
h = Thickness of fireproofing, ranging from 0.25 to 3.875 inches.
D = Heated perimeter of steel column (inches).
W = Weight of steel column (lbs. per lineal foot).

Limitations: W/D ratio ranges from a minimum of 0.33 to a maximum of 6.62.
Minimum thickness is $^1/_4$ inch.

[3]As an alternate to Table 2B1, thickness of fireproofing, may be determined on the basis of the following equation:

$T = (R - 12.49)/[265.75(A/P)]$

where:
R = Fire resistance (minutes).
A = Cross-sectional area (square inches).
P = Heated perimeter (inches).
T = Thickness of fireproofing, ranging from 0.375 to 3.875 inches.
A/P equation for tube columns = $t(A + B - 2t)/(A + B)$.
A/P equation for pipe columns = $t(d - t)/d$.

where:
t = Wall thickness of column.
A = Length of horizontal side (inches).
B = Length of vertical side (inches).
d = Diameter of pipe (inches).

Limitations: A/P ratio ranges from a minimum of 0.18 to a maximum of 2. Thickness is between $^1/_4$ inch and $3^7/_8$ inches.

[4]As an alternate to Table 2B2, thickness of fireproofing, may be determined on the basis of the following equation:

$T = (R - 0.2)/[4.43(A/P)]$

where:
R = Fire resistance (hours).
A = Cross-sectional area (square inches).
P = Heated perimeter (inches).
T = Thickness of fireproofing ranging from 0.375 to 3.875 inches.
A/P equation for tube columns = $t(A + B - 2t)/(A + B)$.
A/P equation for pipe columns = $t(d - t)/d$.

where:
t = Wall thickness of column.
A = Length of horizontal side (inches).
B = Length of vertical side (inches).
d = Diameter of pipe (inches).

Limitations: A/P ratio ranges from a minimum of 0.18 to a maximum of 2. Thickness is between $^1/_4$ inch and $3^7/_8$ inches.

[5]NR = Not recognized.

TABLE 3—MINIMUM AVERAGE THICKNESS OF FIRE PROTECTION MATERIALS APPLIED TO PROTECTED FLOOR ASSEMBLIES: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106, Z-106/HY, Z-106/G, Z-146

A. **Assembly:** Protected floor assemblies with minimum $2^1/_2$-inch-thick concrete slab.

1. **General description:** Steel beams or joists supporting minimum $1^1/_2$-inch-deep steel decking with minimum $2^1/_2$-inch-thick concrete slab over top of flutes.

   a. Metal thickness—minimum gage: fluted 22 MSG, cellular 20/20MSG
   b. Normal-weight or lightweight concrete slab[1].

2. **Metal decking:** Fireproofing thickness (inches).
Fire protection material: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-146, Z-106/HY, Z-106, Z-106/G.

PARAMETER	4 HR.		3 HR.	2 HR.	1HR
	Lightweight concrete $1^1/_2$	Normal-weight concrete $1^1/_2$			
Top and side of flute			$^3/_4$	$^3/_8$	$^3/_8$
Bottom of flute	$1^1/_8$	$^3/_4$	$^1/_2$+	$^3/_8$+	$^3/_8$
Cellular	NR	NR	$^1/_2$+	$^3/_8$+	$^3/_8$

Note: Spatterkote SK-3 required on cellular decking for MK-6/HY, MK-6/HY ES, MK-6s, Z-106 and RG. Lath is required on cellular decking for Z-106, Z-106/HY and Z-106/G.

3. **Trench Headers:** Fireproofing thickness (inches) [2,3,4]:

BOTTOMLESS TRENCH HEADER: MAX. 36 INCHES WIDE	4 HR.	3 HR.	2 HR.	1HR
Top and side of flute	NR	$2^1/_4$	$1^3/_4$	$1^1/_4$
Bottom of flute and cellular	NR	$2^1/_8$	$1^5/_8$	1
Cellular	NR	$2^1/_8$	$1^5/_8$	1

TRENCH HEADER WITH BOTTOM PAN: MAX. 36 INCHES WIDE	4 HR.	3 HR.	2 HR.	1 HR.
Top and side of flute	NR	$2^1/_4$	$1^1/_8$	$1^1/_8$
Bottom of flute	NR	$2^1/_8$	$1^1/_8$	$1^1/_8$
Cellular	NR	$2^1/_8$	$1^1/_8$	$1^1/_8$

TRENCH HEADER WITH INTERMITTENT BOTTOM PAN: MAX. 36 INCHES WIDE	4 HR.	3 HR.	2 HR.	1 HR.
Top and side of flute	NR	NR	2	2
Bottom of flute, cellular	NR	NR	$1^3/_4$	1

4. **Electrified inserts:** Fireproofing thickness (inches)[5]:

(1) Insert where concrete is not removed from deck valleys and insert on top [6,7]:				
	4 HR.	3 HR.	2 HR.	1 HR.
Normal-weight concrete slab	NR	$^3/_4$	$^5/_8$	$^5/_8$
Lightweight concrete slab	NR	$1^1/_8$	$^3/_4$	$^3/_4$

(2) Inserts which penetrate sides of deck cells, and there is no concrete in valleys between cells under insert[7]				
	4 HR.	3 HR.	2 HR.	1 HR.
Preset: Dual service				
Normal-weight concrete slab	NR	$1^1/_4$	$^7/_8$	$^1/_2$+
Lightweight concrete slab	NR	$1^3/_8$	$^3/_4$	$^1/_2$+
Preset: Triple service				
Normal-weight concrete slab	NR	$1^1/_4$	$^5/_8$	$^1/_2$+
Lightweight concrete slab	NR	$1^1/_2$	$^3/_4$	$^1/_2$+

(3) Inserts contain internal modifications and penetrate sides of deck cells where no concrete is in valleys under insert[7]				
	4 HR.	3 HR.	2 HR.	1 HR.
Preset: Dual service				
Normal-weight concrete slab	NR	3/4	1/2+	3/8+
Lightweight concrete slab	NR	NR	3/4	1/2+
Preset: Triple service				
Normal-weight concrete slab	NR	3/4	1/2+	3/8+
Lightweight concrete slab	NR	NR	7/8	5/8

(4) Inserts which penetrate top of deck cells, and there is no concrete in valleys between cells under insert [8]				
	4 HR.	3 HR.	2 HR.	1 HR.
Preset: Triple service; aluminum plate placed on top of insert				
Normal-weight or lightweight concrete slab	NR	NR	7/8	5/8
Preset: Triple service; zinc plate placed on top, sides or bottom of insert				
Normal-weight or lightweight concrete slab	NR	1	5/8	3/8

B. **Assembly:** Protected floor assemblies with minimum 2-inch-thick concrete slab.

1. **General description:** Steel beams supporting minimum 2-inch-deep steel decking with minimum 2-inch-thick concrete slab over top of flute.

   a. Metal thickness—minimum gage: Fluted 22 MSG, cellular 20/18MSG.
   b. Normal-weight or lightweight concrete slab.[1]

2. **Metal Decking:** Fireproofing thickness (inches).
   Fire protection material: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106/HY, Z-106/G, Z-146 and Z-106:

NORMAL-WEIGHT CONCRETE SLAB:	4 HR.	3 HR.	2 HR.	1 HR.
Top and side of flute	NR	1 1/4	5/8	1/2+
Bottom of flute	NR	1 1/4	5/8	1/2+
Cellular	NR	1 1/4	7/8	1/2+

LIGHTWEIGHT CONCRETE SLAB	4 HR.	3 HR.	2 HR.	1 HR.
Top and side of flute	NR	1 1/2	1	5/8
Bottom of flute	NR	1 1/2	1	5/8
Cellular	NR	1 1/2	1	5/8

C. **Construction:** Structural members supporting protected floor decks[14]

1. **Floor beams supporting a normal-weight concrete slab or fluted form units with normal-weight concrete topping. Minimum unrestrained fireproofing thickness (inches)[9,10]:**

BEAM SIZE	MINIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
W 8 × 67	1.60	1 3/8	7/8	5/8	3/8+
W 10 × 60	1.20	1 5/8	1	3/4	1/2+
W 8 × 28	0.80	1 5/8 (2 1/4")	1 1/4 (1 1/2")	7/8 (1")	1/2+ (5/8")
W 8 × 10	0.37	2 7/8	1 7/8	1 3/8	3/4

2. **Floor beams supporting mixed/cellular decking with a normal-weight concrete slab[9,10]:**

BEAM SIZE	MINIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
W 8 × 67	1.60	1 1/2	1	5/8	1/2+
W 10 × 60	1.20	1 3/4	1 1/4	7/8	1/2+
W 8 × 28	0.80	2 (2 1/4*)	1 1/4 (1 1/2*)	7/8 (1*)	1/2+ (5/8*)
W 8 × 10	0.37	3 1/4	2 1/4	1 1/2	1

3. **Floor beams supporting a lightweight concrete slab or fluted form units with lightweight concrete topping:** Minimum unrestrained fireproofing thickness (inches)[9,10]:

BEAM SIZE	MINIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
W 8 × 67	1.60	1 3/8	1	3/4	3/4
W 10 × 60	1.20	1 5/8	1 1/4	7/8	1/2+
W 8 × 28	0.80	1 5/8 (2 1/4*)	1 3/8 (1 3/4*)	1 (1 1/8*)	1/2+ (5/8*)
W 8 × 10	0.37	1 5/8	2 3/8	1 1/2	3/4

4. **Floor beams supporting mixed/cellular decking with a lightweight concrete slab[9,10]:**

BEAM SIZE	MINIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
W 8 × 67	1.60	1 1/2	1	3/4	1/2+
W 10 × 60	1.20	1 3/4	1 1/4	7/8	1/2+
W 8 × 28	0.80	2 (2 3/8*)	1 5/8 (1 3/4*)	1 (1 1/8*)	1/2+ (5/8*)
W 8 × 10	0.37	3 1/4	2 5/8	1 1/2	3/4

5. **Floor joists supporting mixed cellular/fluted decking with lightweight or normal-weight concrete slab or with solid concrete slab:**

JOISTS AND BRIDGING[1,11,12,13] WITH OR WITHOUT LATH, SCRIM OR NET	SPACING	4 HR.	3 HR.	2 HR.	1 HR.
Top and bottom chords consist of two angles with a minimum total area of 0.96 and 0.77 sq. in., respectively. Web members are either round bars or angles. Minimum area for the end diagonal web is 0.444 sq. in. Minimum area for the first six interior diagonal webs is 0.406 sq. in. All other interior webs have a minimum area of 0.196 sq. in.	NA	2 7/8	2 3/4	2 1/4	1 1/8
Top and bottom chords consist of two angles with a minimum total area of 1.74 sq. in. First five web members are either round bars or angles, 0.886 sq. in. All other interior webs have a minimum area of 0.441 sq. in.	NA	2 7/8	2 7/8	2 1/8	1
10K1 30 ksi	More than 4 ft. o.c.	NR	3 1/4	2 1/4	1 1/8
10K1 30 ksi	Less or equal to 4 ft. o.c.	NR	2 7/8	1 7/8	1
Min. 16K2 joists with max. 30 ksi tensile stress and for min. 12K3 joists at 24 ksi max. tensile stress	More than 4 ft. o.c.	NR	2 1/4	1 5/8	1
Min. 16K2 joists with max. 30 ksi tensile stress and for min. 12K3 joists at 24 ksi max. tensile stress	Less or equal to 4 ft. o.c.	NR	2 1/8	1 1/2	1

For **SI:** 1 inch = 25.4 mm.

NR = Not recognized
NA = Not applicable

+ Increase thickness by 1/16 inch for Z-106/HY to the nearest 1/8 inch.
*Protection thicknesses when lower flange edge thickness is reduced to one-half.

[1]Normal-weight concrete has a minimum compressive strength of 3,000 psi and a minimum unit weight of 148 pcf, and utilizes either carbonate or siliceous aggregates. Lightweight concrete has a minimum compressive strength of 3,000 psi and a minimum unit weight of 110 pcf. Concrete shall encapsulate 6 × 6 W1.4 × W1.4 welded wire fabric.

[2]Fireproofing thickness under bottomless and intermittent trench headers to be 4 inches beyond each side of trench header. Fireproofing thickness under trench headers with bottom pans to be 5 inches beyond each side of trench header. Allowable loads must be based on noncomposite design.

[3]The cellular (flat plate) portion of units under trench headers shall have welded thereto Nelson steel studs consisting of No. 12 SWG galvanized wire, attached to a $1^{3}/_{16}$-inch-diameter No. 28 MSG galv. steel disc. Studs to be in rows parallel to the trench. Studs shall average at least one stud per 236 sq. in. of cellular floor units beneath the trench, a maximum of 4 inches from edge of trench header with a maximum of 22 inches between rows and 24 inches between studs. For three-hour protection, the stud length shall be $2^{1}/_{8}$ inches. For two-hour protection, the stud length shall be $1^{3}/_{8}$ inches.

[4]Intermittent bottom trench header consists of a horizontal closure plate (minimum 22 MSG) over the fluted deck section, which is affixed to floor units by welds or screws. Fireproofing thickness for 24-inch-wide intermittent bottom trench headers is $1^{1}/_{8}$ inches for a two-hour rating.

[5]Fireproofing thickness for all inserts shall be sprayed the entire width and length of cellular units between supports and shall extend beyond the edge of inserts for a horizontal width of 12 inches.

[6]Spacing for unused condition shall not be more than one insert for each 6 sq. ft. of floor area, with not less than 30 inches between inserts along deck unit and 18 inches in the transverse direction. Active inserts can not exceed more than one in each 12 sq. ft. Unused inserts are packed with mineral wool block or covered with concrete.

[7]Spacing shall be not more than one insert in each $7^{1}/_{2}$ sq. ft. of floor area, with not less than $25^{1}/_{2}$ inches between edges of adjacent inserts.

[8]Spacing shall not be more than one inset in each 8 sq. ft. of floor area, with not less than 2 feet center-to-center of adjacent inserts.

[9]Bridging bars and angles shall be protected with the coating material thickness for a minimum distance of 12 inches beyond the insert.

[10]As an alternate to Table 2C, Items 1 through 4, thickness for unrestrained beams may be determined on the basis of the following equation:

$$T1 = \frac{[(W2/D2) - 0.6]T2}{[(W1/D1) - 0.6]}$$

where:

T = Thickness of fireproofing (inches).
W = Weight of steel beam (pounds per lineal foot).
D = Heated perimeter of steel beam (inches).
1 = Refers to desired beam size and required material thickness.
2 = Refers to W8×28 beam size and appropriate material thickness in Tables C1 through C4.

Limitations: Minimum thickness shall not be less than $^{3}/_{8}$ inch.
W/D ratios shall not be less than 0.37.

[11]Fire-resistive protection is applied directly to exposed beam contour or boxed with expanded metal lath.

[12]Fireproofing shall be applied to joist following joist contour. 1.7 to 3.4 lb./sq. yd. diamond mesh $^{3}/_{8}$-inch expanded steel lath or $^{3}/_{32}$-inch to $^{3}/_{10}$-inch fiberglass scrim fabric or 20 mil strand $^{3}/_{16}$-inch plastic net secured to one side of each steel joist are optional. If metal lath is used, lath is to be fully covered, with no minimum thickness requirement. If fiberglass mesh is used, mesh is not required to be fully covered.

[13]Thickness of fireproofing shall be $1^{1}/_{2}$ inches up to 2-hour rating for min. 16K2 joists with minimum $^{3}/_{4}$-inch-diameter web members or for LH joists.

[14]Min. 5 pcf or less density polystyrene can be used over the deck without affecting the deck or beam protection thicknesses. When other rigid thermal insulations or more than 5 pcf polystyrene is used over the deck, the deck and beam protection thickness must be increased to the next $^{1}/_{2}$ hourly rating using interpolation. As an alternative for floor beam thickness, roof beam thickness can be substituted using the thickness for the same hourly rating.

TABLE 4—MINIMUM AVERAGE THICKNESS OF FIRE-PROTECTION MATERIALS APPLIED TO UNPROTECTED FLOOR ASSEMBLIES: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106, Z-106/HY, Z-106/G, Z-146

1. General description: Steel beams or joists supporting a floor deck with no fireproofing materials applied to the deck soffit.

a. Metal thickness minimum gage: Fluted 22 MSG
b. Normal-weight or lightweight fire-resistive concrete slab[1,2]. Minimum $2^1/_2$ inches of concrete over the top flute with 6 × 6 × 1.4 × 1.4 welded wire fabric for the beam condition. Thickness for the assembly rating is a separate consideration.[2]

2. Floor beams and joists supporting unprotected floor deck: Minimum unrestrained fireproofing thickness (inches)[3, 4, 5, 6, 7, 8].

BEAM SIZE	MAXIMUM W/D RATIO	4 HR.	3 HR.	2 HR.	1 HR.
W 8 × 67	1.60	$1^1/_8$	$^7/_8$	$^3/_8$	$^3/_8$+
W 10 × 60	1.20	$1^1/_8$	$1^1/_8$	$^7/_8$	$^3/_8$+
W 8 × 28	0.80	$1^5/_8$ (2*)	$1^3/_8$ ($1^1/_2$*)	1 (1*)	$^1/_2$+ ($^1/_2$*)+
W 8 × 10	0.37	$2^3/_8$	2	$1^1/_2$	$^3/_4$
	SPACING	**4 HR.**	**3 HR.**	**2 HR.**	**1 HR.**
10K1 30 ksi	More than 4 ft. o.c.	NR	$3^1/_2$	$2^1/_4$	$1^1/_8$
10K1 30 ksi	Less or equal to 4 ft. o.c.	NR	$2^7/_8$	$1^7/_8$	1
Min. 12 K5, max. 24 ksi tensile stress	NA	NR	$3^1/_2$	$2^1/_8$	1
Top and bottom chords consist of two angles with a minimum total area of 0.96 and 0.77 sq. in., respectively. Web members are either round bars or angles. Minimum area for the end diagonal web is 0.444 sq. in. Minimum area for the first six interior diagonal webs is 0.406 sq. in. All other interior webs have a minimum area of 0.196 sq. in.	NA	$2^7/_8$	$2^3/_4$	$2^1/_4$	$1^1/_8$
Min. 16K2 joists with max. 30 ksi tensile stress, and for min. 12K3 joists at 24 ksi max. tensile stress	More than 4 ft. o.c.	NR	$3^1/_2$	$2^1/_8$	1
Min. 16K2 joists with max. 30 ksi tensile stress, and for min. 12K3 joists at 24 ksi max. tensile stress	Less or equal to 4 ft. o.c.	NR	$2^7/_8$	$1^7/_8$	1

For SI: 1 inch = 25.4 mm.

NR = Not recognized.
NA = Not applicable.

*Protection thicknesses when lower flange edge thickness is reduced to one-half.
+Increase thickness by $^1/_{16}$ inch for Z-106/HY to the nearest $^1/_8$ inch.
[1]Normal-weight concrete has a minimum compressive strength of 3,000 psi and a minimum unit weight of 148 pcf, and utilizes either carbonate or siliceous aggregates. Lightweight concrete has a minimum compressive strength of 3,000 psi and a minimum unit weight of 100 pcf. Concrete shall encapsulate 6 × 6 - W1.4 × W1.4 welded wire fabric.

[2]Minimum concrete slab or fill thickness must be recognized under a current ICBO ES evaluation report for the floor assembly and fire-resistive rating desired.

[3]As an alternate to Table 3, Item 2, thickness for unrestrained beams may be determined by the following equation:

$$T1 = \frac{[(W2/D2) - 0.6]T2}{[(W1/D1) - 0.6]}$$

where:

T = Thickness of fireproofing (inches).
W = Weight of steel beam (pounds per lineal foot).
D = Heated perimeter of steel beam (inches).
1 = Refers to desired beam size and required metal thickness.
2 = Refers to given beam size and material thickness.

Limitations: Minimum thickness shall not be less than $^3/_8$ inch.
W/D ratios shall not be less than 0.37.

[4]Thickness of fireproofing shall be $1^1/_2$ inches up to 2-hour ratings for min. 16K6 joists min., $^3/_4$-inch-diameter web members, or for LH joists extending 12 inches on both sides.

[5]Fire-resistive protection is applied directly to exposed beam contour or boxed with metal expanded lath.

[6]Use of 1.7 to 3.4 lb/sq. yd. diamond mesh $^3/_8$-inch expanded steel lath, of $^3/_{32}$-inch to $^3/_{16}$-inch fiberglass scrim fabric or 20 mil strand $^3/_{16}$-inch plastic net secured to one side of each joist is optional.

[7]Bridging bars or angles shall be protected with the coating material thickness required for a minimum distance of 12 inches beyond the joist.

[8]Min. 5 pcf or less density polystyrene can be used over the deck without affecting the deck or beam protection thicknesses. When other rigid thermal insulations or more than 5 pcf polystyrene is used over the deck, beam protection thickness must be increased to the next $^1/_2$ hourly rating using interpolation. As an alternative for floor beam thickness, roof beam thickness can be substituted, using the thickness for the same hourly rating.

TABLE 5—CONCRETE PAN JOIST: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106, Z-106/HY, Z-106/G, Z-146

1. General description: Pan joists, poured in-place normal-weight concrete construction.

1. Minimum total $2^1/_2$-inch thickness with maximum 30-inch span between joists.
2. Three-fourths-inch minimum concrete cover for joist reinforcement.

2. Fireproofing thickness (inches):

PARAMETER	4 HR.	3 HR.	2 HR.	1 HR.
Slab soffit	NR	NR	$^7/_8$	$^7/_8$

For **SI:** 1 inch = 25.4 mm.

TABLE 6—MINIMUM AVERAGE THICKNESS OF FIRE PROTECTION MATERIALS APPLIED TO STEEL TRUSSES (Inches)[1,2]: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106, Z-106/HY, Z-106/G, Z-146

The thickness of fire protection materials applied to structural steel trusses is determined in accordance with UBC Standard 7-7, Part I, as follows:

Step 1: Determine the W/D ratio for each individual element of the truss. W/D ratios are defined as the weight per lineal foot (W) of the element in pounds divided by the heated perimeter (D) of the element (sides directly exposed to heat in a fire) in lineal inches. The weight-to-heated perimeter (W/D ratio) of truss elements which directly support floor or roof constructions, i.e., top chords, shall be determined on the same basis as for beams and girders. The method to calculate the heated perimeter (D) of the top chord is illustrated in the left hand figure below. The weight-to-heated perimeter ratio (W/D ratio) of truss elements which can be simultaneously exposed to fire on all sides, i.e., webs and bottom chords shall be determined on the same basis as columns. The method to calculate the heated perimeter of the web and bottom chord is illustrated in the right hand figure below. For different shapes not illustrated in the figures below, the same general methodology applies.

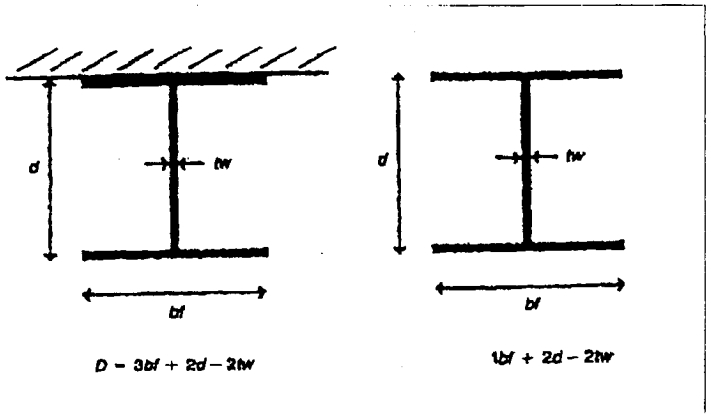
Step 2: Substitute the W/D ratio for each individual element of the truss into the formula below to determine the thickness of protection required (inches):

$t = R/[63(W/D) + 37]$

where:

t = Thickness of fireproofing protection (inches).
R = Fire resistance (minutes).
W = Weight of steel, lbs./lin. ft.
D = Heated perimeter of each truss element (inches)[3].

Note: Where truss construction includes tube or pipe steel elements, the thickness of protection for the tube or pipe steel shall be taken from Table 1, Item B, of this report.



[1]Methodology presented in this table is limited to unrestrained conditions.

[2]As an alternate to the formula, thickness may be taken from Table 1 columns using the appropriate minimum W/D ratio.

[3]Minimum chord or web member size has W/D ratio = 0.33. Other steel shapes with W/D ratios greater than 0.33 may be used.

[4]Top flange of the top chord supports concrete slab or steel deck units.

TABLE 7—MINIMUM AVERAGE THICKNESS OF FIRE PROTECTION MATERIALS APPLIED TO PROTECTED ROOF ASSEMBLIES[1,2,3]: MK-6/HY, MK-6/HY ES, MK-6s, RG, Z-106, Z-106/HY, Z-106/G, Z-146

A. Roof assembly with polyisocyanurate insulation board or mineral and fiber and fiberglass insulation boards.

1. **Structural support:** Steel beams or joists supporting minimum 1 1/2-inch fluted steel decking, minimum No. 22 MSG gage.

2. **Wallboard:** Five-eighths-inch-thick gypsum board fastened or adhered to metal roof deck under insulation board.

3. **Insulation type:**

   a. Polyisocyanurate insulation boards: Minimum 2 inches thick with gypsum wallboard, minimum 3 inches thick without gypsum wallboard, or

   b. Mineral and fiber board: Minimum thickness 1 inch. Minimum thickness 2 inches when Item 4b or Item 4c is used; or

   c. Fiberglass insulation board: Minimum thickness 3/4 inches for one hour and 1 3/4 inches for two hours. Minimum 1 3/4 inches when Item 4b or Item 4c is used.

   d. Polystyrene foamed plastic insulation boards: Minimum thickness 1 inch, maximum thickness 8 inches, and maximum density 2.5 pcf. Insulation boards must be used with 5/8-inch-thick gypsum wallboard fastened or adhered to metal roof deck under insulation board.

4. **Roof covering:**

   a. Hot-mopped or cold-applied Class A, B, or C roof covering.
   b. Ballasted, adhered or mechanically attached single-ply roof covering.
   c. Metal roof deck panels in addition to or in lieu of Items 4a and 4b.

5. **Fire protection material thickness for unrestrained ratings (inches):**

PARAMETER	3 HR.	2 HR.	1 HR.
Deck without gypsum wallboard	2 3/8	1 3/4	1
Deck with gypsum wallboard	1 5/8	1 1/8	5/8

B. Assembly: Extruded polystyrene foamed plastic roof insulation boards.

1. **Structural support:** Steel beams or joists supporting minimum 1 1/2-inch fluted steel decking, minimum No. 22 MSG gage.

2. **Wallboard:** Five-eighths-inch-thick gypsum wallboard fastened or adhered to metal roof deck under insulation board.

3. **Insulation:** Extruded polystyrene, minimum thickness 1 inch, maximum thickness 8 inches, and maximum density 2.5 pcf. insulation boards.

4. **Roof covering:**

   a. Hot-mopped or cold-applied Class A, B or C roof covering.
   b. Ballasted, adhered or mechanically attached single-ply roof covering.

5. **Fire-protection material thickness for unrestrained rating (inches)[2]:**

PARAMETER	3 HR.	2 HR.	1 HR.
Deck with gypsum wallboard	NR	$1^{5}/_{8}$	$^{3}/_{4}$

C. Roof assembly with polyurethane foam plastic roof insulation:

1. **Structural support:** Steel beams or joists supporting minimum $1^{1}/_{2}$-inch-deep fluted steel decking, minimum No. 22 MSG gage.

2. **Wallboard:** Five-eighths-inch-thick gypsum fastened or adhered to metal deck under insulation.

3. **Insulation type:** Polyurethane foamed plastic formed by the simultaneous spraying of two liquid components applied over the gypsum wallboard at a nominal thickness of 1 to 5 inches.

4. **Fire-protection material thickness for unrestrained ratings (inches):**

PARAMETER	3 HR.	2 HR.	1 HR.
Deck with gypsum wallboard	$2^{1}/_{2}$	$2^{1}/_{8}$	$1^{1}/_{2}$

D. Roof assembly with no minimum insulation thickness:

1. **Structural support:** Steel beams or joists supporting minimum $1^{1}/_{2}$-inch fluted steel decking, minimum No. 22 MSG gage.

2. **Wallboard:** Five-eighths-inch-thick gypsum board fastened or adhered to metal roof deck under insulation board.

3. **Insulation:** No minimum insulation thicknesses with or without gypsum wallboard.

4. **Roof covering:**

   a. Hot-mopped or cold-applied Class A, B, or C roof covering.
   b. Ballasted, adhered or mechanically attached single-ply roof covering.
   c. Metal roof deck panels in addition to or in lieu of Items 4a and 4b.

5. **Fire protection materials:** MK-6/HY, MK-6s, MK-6/HY, ES, RG, Z-106, Z-106/HY, Z-106/G.

6. **Fire protection material thickness for unrestrained ratings (inches):**

PARAMETER	3 HR.	2 HR.	1 HR.
Deck without gypsum wallboard	$3^{3}/_{4}$	$2^{5}/_{8}$	$1^{5}/_{8}$
Deck with gypsum wallboard	$3^{3}/_{4}$	2	1

E. Roof assembly with no minimum insulation thickness:

1. **Structural support:** Steel beams or joists supporting minimum $1^{1}/_{2}$-inch fluted steel decking, minimum No. 22 MSG gage.

2. **Wallboard:** Five-eighths-inch-thick gypsum board fastened or adhered to metal roof deck under insulation board.

3. **Insulation:** No minimum insulation thicknesses with or without gypsum wallboard.

4. **Roof covering:**

   a. Hot-mopped or cold-applied Class A, B, or C roof covering.
   b. Ballasted, adhered or mechanically attached single-ply roof covering.
   c. Metal roof deck panels in addition to or in lieu of Items 4a and 4b.

5. **Fire protection materials:** Z-146.

6. **Fire protection material thickness for unrestrained ratings (inches):**

PARAMETER	3 HR.	2 HR.	1 HR.
Deck without gypsum wallboard	$3^3/_4$	$2^3/_8$	$1^1/_2$
Deck with gypsum wallboard	$3^3/_4$	2	1

F. **Wide flange member protection[3]:**

BEAMS	MINIMUM W/D RATIO	3 HR.	2 HR.	1 HR.
Min. W8 × 28	0.80	$1^3/_8$ [$1^5/_8$]	$^7/_8$ [$1^1/_8$]	$^1/_2$+ [$^5/_8$]
Min. W6 × 16	0.66	$1^1/_2$ [$1^7/_8$]	1 [$1^1/_4$]	$^5/_8$ [$^1/_2$]
Min. W8 × 10	0.37	2 [$2^3/_8$]	$1^3/_8$ [$1^5/_8$]	$^3/_4$ [$^3/_4$]

G. **Steel joist protection[4,5]:**

SIZE AND SPACING OF STEEL JOISTS	3 HR.	2 HR.	1 HR.
10K1 with or without scrim or lath spaced > 4 ft. o.c.	$3^1/_4$	$2^1/_4$	$1^1/_8$
10K1 with or without scrim or lath spaced • •4 ft. o.c.	$2^7/_8$	$1^7/_8$	1
12K3 24 ksi max or 16K2 30 ksi max. joists with or without scrim > 4 ft o.c.	$2^1/_4$	$1^5/_8$	1
12K3 24 ksi max or 16K2 30 ksi max. joists with or without scrim • •4 ft. o.c.	$2^1/_8$	$1^1/_2$	1

For **SI:** 1 inch = 25.4 mm.

* Spatterkote SK3 required on roof decking for MK-6/HY, MK-6/HY ES, MK-6s, Z-106/G, and RG. Firebond is required on roof decking for Z-106/HY. Lath is required on rood decking with Z-146.

+Increase thickness by $^1/_{16}$ inch for Z-106/HY to the nearest $^1/_8$ inch.

[1]Insulation and roof covering and method of securement must be classified by Underwriters Laboratories Inc. and be recognized in a current evaluation report. Where foam plastic insulation is used, it must be recognized in the roof covering evaluation report.

[2]NR = Not recognized.

[3]As an alternate to the roof beam thickness provided in Table 6-F, thicknesses for unrestrained beams may be determined by the following equation:

$$T1 \cdot\cdot \frac{[(W2/D2) \cdot\cdot 0.6]T2}{[(W1/D1) \cdot\cdot 0.6]}$$

where:

T = Thickness of fireproofing.
W = Weight of steel beam (pounds per lineal foot).
D = Heated perimeter of steel beam (inches).
1 = Refers to desired beam size and required material thickness.
2 = Refers to given beam size and material thickness in table.

Limitations: Minimum thickness shall not be less than $^3/_8$ inch.
W/D ratios shall not be less than 0.37.

[4]1.7 to 3.4 lb./sq. yd. diamond mesh $^3/_8$-inch metal lath, $^3/_{32}$-to $^3/_{16}$-inch fiberglass scrim fabric, or 20 mil strand $^3/_{16}$-inch plastic net secured to one side of each steel joist is optimal.

[5]Bridging bars or angles shall be protected with the coating material thickness required for a minimum distance of 12 inches beyond the joist.

TABLE 8—MINIMUM AVERAGE THICKNESS OF FIRE-PROTECTION MATERIALS APPLIED TO UNPROTECTED ROOF ASSEMBLY: MK-6/HY, MK-6s, RG, Z-106, Z-106/HY, Z-106/G, Z-146

A. Insulating concrete roof system:[1]

1. **Structural support:** Steel beams or joist supporting a minimum $^9/_{16}$-inch fluted steel decking, minimum No. 24 gage, vented or nonvented galvanized units with clear spans as required by insulating concrete manufacturer's evaluation report.[2]

2. **Insulating concrete assembly:** Vermiculite concrete and insulation board as required by insulating concrete manufacturer's evaluation report.[3]

3. **Wire mesh:** As required by insulating concrete manufacturer's evaluation report.

4. **Roof covering:**

   a. Class A, B or C roof covering
   b. Ballasted, adhered or mechanically fastened classified single-ply membrane.

5. Wide flange beam thickness in brackets [ ] may be used when half-flange tip thicknesses are used on the bottom flange tips.

6A. Beam protection: Fireproofing thickness (inches)[4]:

PARAMETER	MINIMUM W/D RATIO	3 HR.	2 HR.	1 HR.
Min. W8 × 28	0.80	2 [$2^3/_8$]	$1^1/_2$ [$1^7/_8$]	$^5/_8$ [$^3/_4$]
Min. W6 × 16	0.66	$2^1/_4$ [3]	$1^1/_2$ [$1^7/_8$]	$^5/_8$ [$^3/_4$]
Min. W8 × 10	0.37	3 [$3^3/_8$]	$2^1/_4$ [$2^3/_4$]	$^7/_8$ [$1^1/_8$]

6B. Steel joist protection[5,6]:

SIZE AND SPACING OF STEEL JOISTS	3 HR.	2 HR.	1 HR.
10K1 with or without scrim > 4 ft. o.c.	$3^1/_2$	$2^1/_4$	$1^1/_8$
10K1 with or without scrim • 4 ft. o.c.	$2^7/_8$	$1^7/_8$	1
12K3 24 ksi or 16K2 30 ksi joists with or without scrim > 4 ft.	$3^1/_2$	$2^1/_8$	1
12K3 24 ksi max. or 16K2 30 ksi max joists with or without scrim • 4 ft. o.c.	$2^7/_8$	$1^7/_8$	1
12K5 at 24 ksi max. with or without scrim > 4 ft or • 4 ft. o.c.	$3^1/_8$	$2^1/_8$	1

For SI: 1 inch = 25.4 mm.

[1]Insulation and roof covering method of securement must be classified by Underwriters Laboratories Inc. and be recognized in a current evaluation report. Where foam plastic insulation is used, it must be recognized in the roof covering evaluation report.

[2]Design stress of the steel deck units shall not exceed 75 percent of their allowable bending stress.

[3]Insulating concrete manufacturer's specific application instructions, wire mesh requirements, minimum dry density requirements of concrete and insulation board requirements as specified in individual manufacturer's evaluation reports.

[4]As an alternate to Table 6, Item 6, thicknesses for unrestrained beams may be determined by the following equation:

$$T1 = \frac{[(W2/D2) - 0.6]T2}{[(W1/D1) - 0.6]}$$

where:

- T = Thickness of fireproofing.
- W = Weight of steel beam (pounds per lineal foot).
- D = Heated perimeter of steel beam (inches).
- 1 = Refers to desired beam size and required material thickness.
- 2 = Refers to given beam size and material thickness in Table 2A, Item 3 or 4.

Limitations: Minimum thickness shall not be less than $^3/_8$ inch.
W/D ratios shall not be less than 0.37.

[5]Use of 1.7 to 3.4 lb./sq. yd. diamond mesh $^3/_8$-inch expanded steel lath, $^3/_{32}$- to $^3/_{16}$-inch fiberglass scrim fabric, or 20 mil strand $^3/_{10}$-inch plastic net secured to one side of each steel joist is optional.

[6]Bridging bars or angles shall be protected with the coating material thickness required for a minimum distance of 12 inches beyond the joist.

SECTION 07840

FIRESTOPPING AND SMOKE SEALS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide firestopping and smoke sealing of the penetrations through walls, floors, and ceilings as shown on the Drawings, required by Code, and as specified, complete.

1.02 REFERENCES: Conform Work of this Section to the reference standards and specifications of the issues listed below (refer to Section 01420 if issue date is not listed), to the requirements indicated and specified, to required fire ratings, and to the pertaining regulatory requirements of the authorities having jurisdiction. The specifications, codes, publications, and standards listed but referred to hereafter by the basic designation only form a part of this Section to the extent referenced herein:

A. American Society for Testing and Materials (ASTM):

E814-02.....Test Methods for Fire Tests of Through-Penetration Fire Stops.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit each firestopping material manufacturer's detailed preparation and installation instructions covering all conditions of the Work, with copies of Code approvals.

B. List: With Product Data, include an itemized listing of all openings and penetrations to receive firestopping systems, each listed item accompanied by firestopping material manufacturer's UL Classification Number for the specific opening or penetration, based on the classification tests performed according to ASTM E814 and UL 1479 and UL approved; also include substantiating evidence from the UL Fire Resistance Directory, current edition. Typical installations may be listed by room number with firestopping identified by type for the listed rooms.

C. Certificate: Upon completion, Contractor shall inspect all firestopping and smoke sealing, and shall submit a written certification that all materials and workmanship conform to Specifications and Code requirements.

1.04 QUALITY ASSURANCE:

A. Regulatory Requirements: Work of this Section shall be governed by requirements of the Uniform Building Code, 1997 Edition except as such requirements may be exceeded herein or indicated, or deviations from UBC requirements are specifically authorized in advance by Building Official and Building Department.

B. Firestopping and Smoke Sealing Materials and Systems: UL Classification Number listed in UL Fire Resistance Directory. The firestopping and smoke barrier assemblies shall not lower the fire rating and shall not damage structural integrity of the fire-rated assembly. Firestopping materials shall comply with ASTM E814 and UL 1479 test standards for performance of through-penetrations, and shall comply with ASTM E119 test standards for the performance of floors, ceilings, walls, and partitions under fire exposure.

1.05 PRODUCT DELIVERY: Deliver firestopping and smoke sealing materials to site in sealed factory-labeled containers, all labels bearing a statement of conformance to standards specified for each material.

PART 2 - PRODUCTS

2.01 MATERIALS: Asbestos-free firestopping materials capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ASTM E814 and UL 1479 and providing fire-rating

as indicated on Drawings. Furnish UL labeled and listed fire and smoke and barrier systems, complete with metal collars, incombustible mineral wool or fibrous glass packings and seals, and other accessories required for complete sealing of penetrations. In the fire safing system as required, include polymer firestopping sealant that has been tested in accordance with ASTM E814, is UL listed and labeled, and that meets the 1-hour, 2-hour, or 3-hour fire resistive requirements for the location where installed.

A. Manufacture: Provide system selected to meet actual conditions at the site, conforming systems from one or more of the following manufacturers:

1. USG Thermafiber Fire/Smoke Stop System including 2" thick Smoke Seal Caulking Compound.
2. 3M Fire Barrier Penetration Sealing System, intumescent type, non-sag and self-leveling types as required.
3. Dow Corning Fire Stop Sealants #2000 and Foam #2001.
4. Tremco "Fyre Shield", "Fyre-Sil", and "Fyre-Sil SL" systems.

B. Systems: Products of 3M and USG are specified to establish the intended types and qualities of materials and systems. Products shall be used only within UL labeled and listed system:

1. Latex Calking -- 3M Fire Barrier CP 25WB Caulk, or equal.
2. Synthetic Elastomer Calking -- 3M Fire Barrier CP 25 N/S No-Sag Caulk and CP 25 S/L Self-Leveling Caulk, or equal.
3. Putty -- 3M Fire Barrier Moldable Putty, IPC Flame-Safe FSP1000, or equal.
4. Wrap Strip -- 3M Brand Fire Barrier FS-195 Wrap/Strip, or equal.
5. Compound -- USG Firecode Compound, Domtar Gyproc 90 Fire-Halt Sealant, or equal.
6. Mineral Fiber -- USG Thermafiber Safing Insulation, Schuller PyroFiber, Backer Rod Manufacturing and Supply Co. Ultra Block, or equal safing insulation with a minimum 4 pcf density as required by the approved assembly.
7. Foam -- 3M Fire Barrier 2001, or equal medium-density, two-component silicone elastomer foam as required.
8. Silicone Sealant -- 3M Fire Barrier 2000 and 2003, Pecora Corp. 864 Silicone, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to Architect, in writing, all conditions that interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

3.02 APPLICATION: Use materials best suited to the installation as recommended by the firestopping manufacturer to meet actual field conditions. Conform preparation of surfaces, mixing, and application to manufacturers' printed instructions and UL requirements. Apply to thicknesses as required to provide the fire resistance ratings. Seal all holes or voids made by penetrations to ensure an effective fire and smoke stops where required. Install firestopping materials so void openings 4" or larger will support required floor load, unless the opening is protected from possible loading or traffic.

3.03 DEFECTIVE WORK: Firestopping that becomes loose or is damaged during the course of construction shall be corrected at Contractor's expense.

END OF SECTION

SECTION 07920

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. This Section covers calking of the openings and joints indicated, specified, and required to make the entire building weatherproof and watertight, covers calking requirements for the entire Work, and pertains to any Section requiring calking, unless specified otherwise.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Samples and Data: Submit the following:

1. Samples of cured sealants showing full range of designated colors; obtain color instructions from Architect prior to submittal. Samples of the acoustical sealant materials to be used and catalog cuts shall be submitted to the Architect for approval.
2. Technical data by manufacturers of proposed materials, including installation instructions, recommendations for primers, etc.
3. Material manufacturers' printed preparation and application instructions; when approved, furnish copies to other trades.

B. Calking and Sealant Substrate Compatibility: Submit a list of products for each type of substrate in the Work; include the manufacturers' recommendations for each substrate verifying the product is recommended by the manufacturer for that specific substrate. Where a sealant product is scheduled to contact dissimilar materials within the same joint, submit verification that such product is recommended by the sealant manufacturer for each involved substrate.

C. Site Samples: After approval of above Samples and Data, at site prepare a Sample installation of each type of joint in exterior surfaces to be calked in accordance with this Section. Prepare as many Samples of each type and size as are required for approval at the locations and of sizes designated by Architect. Arrange for sealant manufacturer's technical representative to be present and to assist in correct installation of site Samples. Installed calking and sealants shall conform to the approved Site Samples.

1.03 QUALITY ASSURANCE: Employ a specialist calking contractor having not less than 5 years experience in calking installations of size and complexity required for the Work. Prior to award of subcontract for calking, submit qualifications and project history of the proposed Calking Subcontractor including bid price information. If proposed Calking Subcontractor is not approved, the provisions of the Contract Conditions will apply.

A. Manufacturers' Tests of Sealants: Deliver to sealant manufacturer Samples of all relevant substrates to receive sealants, including finished aluminum, painted aluminum, bronze, coated glass and brackets. Label all such Samples for this Project.

1. Sealant manufacturer shall perform tests to verify adhesion and chemical compatibility. Use the sealants and substrates only in combinations for which favorable adhesion and compatibility results have been obtained.
2. Submit, for record purposes only, sealant manufacturer's written test reports and recommendations regarding cleaning, preparation, and priming.
3. Silicone sealant manufacturers inspections required for long term warranties shall be made by the manufacturer and approved inspectors.

1.04 TECHNICAL ASSISTANCE: Furnish sealant manufacturer's technical field assistance to ensure proper use of sealants, preparation, and application. Include a pre-construction meeting. Manufacturer's representative shall visit the site weekly whenever sealant calking is in progress.

1.05 PRODUCT DELIVERY: Deliver all calking and sealant materials to the site in sealed factory-labeled containers, labels bearing statement of conformance to standards specified for each material.

1.06 WARRANTY: Refer to Section 01790. Furnish a written warranty against defects in sealant materials and sealant application for 20 years covering, without limitation, loss of adhesion or cohesion, leaking, deterioration, color changes, and other defects.

PART 2 - PRODUCTS

2.01 MATERIALS: Furnish sealants meeting following in-service requirements: Normal curing schedules are acceptable; non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required. Furnish the products of only one manufacturer unless otherwise approved, sealant colors as selected to match the adjoining surfaces; special colors may be required.

A. Sealant and Primer: Non-sagging 1-part sealant conforming to Fed Spec TT-S-00230C(2), "Sealing Compound; Elastomeric Type, Single Component", or Fed Spec TT-S-001543A, "Sealing Compound, Silicone Rubber Base", with sealant manufacturer's recommended primer. Non-silicone self-leveling sealant may be furnished for joints in horizontal surfaces.

B. Exception: Furnish multi-component non-tracking sealant having Shore "A" Hardness range of 40 to 55 where exposed to pedestrians or vehicles, conforming to Fed Spec TT-S-00227E(3), "Sealing Compound, Elastomeric Type, Multi-Component".

C. Acoustical Sealant Compound: Shall be non-hardening polysulphide type, or elastic water-base type. Material shall be Tremco Acoustical Sealant, United States Gypsum Acoustical Sealant, or approved equal.

D. Joint Backing: Type approved by sealant manufacturer as both physically and chemically compatible with primer and sealant. Oakum, jute, cotton tape, and vegetable base materials are not acceptable. Furnish uncoated untreated fibrous glass rope or polyethylene, vinyl, silicone, or urethane type polymer sponge or tubing of medium to firm density, not containing oil, butyl, asphalt loading, or neoprene. Use polyethylene film or tape, or aluminum foil for bond breaker.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to the Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section or prevent the correct preparation, priming, and calking installation. Do not proceed with installation in the affected areas until adverse conditions are eliminated or corrected.

3.02 PREPARATION AND PROTECTION: Conform to sealant manufacturer's directions and apply materials to clean dry surfaces free of grease, oils, waxes, or other matter that destroys or impairs adhesion. Remove lacquer coatings on aluminum contacting sealants. Protect all adjoining surfaces and apply temporary masking tape on both sides of joints where surface staining may occur. Fill joints with joint backing material until the joint depth does not exceed 50% of joint width. Provide bond breaker to prevent bonding of sealant to backing material wherever joints exceed 1/2" width, or joint width is shown or required to exceed depth. Prime surfaces as required by manufacturer's instructions.

3.03 APPLICATION: Maximum 3/8" sealant depth unless otherwise shown. Minimum joint width is 1/8" for metal to metal joints and maximum 3/4" width elsewhere unless otherwise shown. Apply sealant under sufficient pressure to fill voids. Finish exposed joints smooth and flush with adjoining surface unless recessed joints are shown. Remove temporary masking as soon as joint is completed.

A. Partition Perimeter (Floor and Ceiling): Partitions shall be sealed where shown on Drawings. Gypsum panels may have joint treatment applied in the normal manner over sealed joints, or panels may be finished with base or trim as desired.

B. Openings: A 1/4" minimum round bead of sealant shall be applied around all cut-outs, such as at electrical boxes and air conditioning ducts, to seal openings.

3.04 CLEANING: Conform to Section 01740. Clean material from surfaces not to receive sealant and restore finish as required. If surfaces adjoining joints are stained and cleaning is not acceptable, remove the affected Work and provide new Work as directed and approved, at no extra cost to Owner.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide hollow metal steel doors and frames, including door louvers, frames for glazed lights in doors, and related items, complete.

A. Related Work:

1. Installation of hollow metal doors and frames.
2. Furnishing finish hardware for hinged metal doors.
3. Glazing in hollow metal.

1.02 REFERENCES:

A. American Society for Testing and Materials (ASTM):

A653-01 .....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit manufacturer's specifications.

B. Shop Drawings: Submit fully detailing the materials, finishes, sizes, profiles, moldings, location of hardware items with reinforcement, and methods for anchoring, assembly, and erection.

C. Samples: Submit the following Samples:

1. Frame corner construction.
2. Door panel and edge construction.
3. Door louvers.
4. Glazing stop corners.

1.04 QUALITY ASSURANCE:

A. Regulatory Requirements: Provide labeled openings conforming to manufacturer's standard procedures filed with and approved by UL. Provide UL labels on doors and frames. Provide steel astragals for pairs of labeled doors unless steel astragals are supplied under Section 08710 or the pair of doors is a tested assembly that does not require astragals and is installed with hardware conforming to the label approval.

1.05 DELIVERY, STORAGE, AND HANDLING: Deliver with suitable spreaders or other method to prevent distortion of the frames, and with doors and frames wrapped in plastic sheeting or cartoned to prevent damage. Store within the building, and handle by means that prevent damage to shop prime coats or other damage.

PART 2 - PRODUCTS

2.01 MATERIALS: As supplied by one of the following manufacturers subject to conformance with requirements herein; refer to Section 01630 for substitutions: Amweld Metal Doors and Frames; Americraft; Krieger Steel Products Co.; Overly Manufacturing Co.; Steelcraft Manufacturing Co.; or Pacific Steel Products.

A. Types: Sizes, types, thicknesses, profiles, details, and features shown for hollow metal govern. In all other respects, provide hollow metal items as standard with manufacturer except as specified herein.

B. Tolerances: Provide door and frame assemblies having a maximum 1/8" gap between top and side edges of wider door face and frame after installation, and maximum 1/4" clearance above finish floor except as otherwise required by floor finish material; provide maximum 1/8" gap between door edges at meeting stiles of pairs of doors.

C. Hollow Metal Doors: Flush panel seamless type with 1-piece face panels, minimum 18 gage steel for interior doors and 16 gage for exterior doors, all parts of face panel and edges continuously welded and finished flush and smooth. Reinforce all face panels with internal welded steel stiffeners, or bond to a plastic-treated honeycomb core or a foamed plastic core except foamed plastic is not allowed for labeled doors. Fill hollow doors with mineral wool, or equal, to eliminate all metallic ring. Provide flush top edges at exterior doors with full welded steel closure plate; screw fastened inverted steel channel void filler is not acceptable. Reinforce door edges according to the manufacturer's standards. Finish both door faces and all door edges smooth and free of seams and distortion. Provide a 1-3/4" by 12 gage full-height steel astragal on active leaf of pairs of doors unless astragals are furnished under Section 08710.

1. Glazed Lights In Doors: Manufacturer's standard steel assembly, one side integral with door and the other side equipped with applied steel stops of minimum 20 gage steel, 1-piece lengths, secured within 3" of ends and maximum 12" centers between with cross-slotted flat-head countersunk screws.

2. Louvers: Manufacturer's standard inverted chevron steel louver units for interior doors, stormproof blade profile type with removable framed bronze or aluminum insect screens on interior side for exterior doors.

D. Hollow Metal Frames: Form the door stops integral with frames. Reinforce heads over 42" wide with full-length 12 gage channel. Provide zinc-coated steel plaster guards behind cutouts for hinges or mortised hardware for frames to be installed in concrete, masonry, or plaster. Fabricate frames with continuously welded joints, exposed welds ground smooth and flush. Fabricate of 14 gage or heavier gage steel if required by UL label requirements, and of following gages unless otherwise indicated or specified: minimum 18 gage steel at all interior openings and minimum 16 gage steel at exterior openings. Frames with bowed jamb or head members are not acceptable.

E. Frame Anchors: Provide steel anchors of proper type for wall or partition construction, minimum 16 gage steel, each anchor prepared for not less than two self-drilling self-tapping "tek" type fasteners where secured to wall studs, not less than three anchors per jamb; if frame height exceeds 84", add an additional anchor for each 18" additional frame height or fraction thereof. Weld anchors into frame except provide adjustable type frame anchors for frames installed in masonry. Provide floor anchors where mortar setting bed or concrete floor fill occurs. Wall anchors shall be one-piece Z-shape steel anchors welded into frame horizontally; vertical Z-anchors are not acceptable. Floor anchors shall be similar, one-piece horizontal type of width same as wall anchors.

F. Hardware Preparation: Prepare, reinforce, mortise, drill, and tap hollow metal according to templates supplied by the hardware supplier, reinforcing as standard with hollow metal manufacturer except minimum 10 gage steel behind butt hinges and 12 gage steel for mortised or surface-applied hardware. Conform to ANSI A115 Series as applicable to the hardware specified in Section 08710 unless otherwise indicated.

G. Finish: Thoroughly clean metal surfaces and apply chemical treatment for paint adhesion. Paint inaccessible surfaces prior to assembling. Sand exposed surfaces of hollow metal and accessories and make smooth with mineral filler as required. Apply hollow metal manufacturer's standard rust inhibitive baked-on primer; include primer on all concealed surfaces of hollow metal door frames and anchors. Provide galvanized anchors where installed in concrete or masonry.

H. Exterior Hollow Metal Items: Hollow metal doors, frames, and accessories located outside the building (such as doors in exterior unroofed walls) shall be fabricated entirely of galvanized or galvannealed steel, gages as specified for standard hollow metal doors and frames. Welding scars and other damage to zinc or galvannealed surfaces shall be dressed smooth and repaired with hot-applied galvanizing repair material as specified in Section 05500.

PART 3 - EXECUTION

3.01 INSTALLATION: Refer to Division 6, Section 06200.

END OF SECTION

SECTION 08213

PLASTIC FACED DOORS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide plastic faced wood doors, complete.

A. Work Included:

1. High pressure laminate faced doors, labeled and non-labeled, including:
   a. Door louvers.
   b. Steel frames for glass lights.
   c. Stainless steel astragals as required.

B. Related Work:

1. Installation of plastic faced doors.
2. Furnishing finish hardware for plastic faced doors.
3. Hollow metal door frames.
4. Glass and glazing.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Samples: Submit Samples of the following unless waived by Architect.

1. Full range of pressure laminate solid colors and wood grained patterns conforming to Interior Design Drawings and Specifications selection and approval.
2. Door construction.
3. Stainless steel edgings and astragals, 12" length.

B. Product Data: Submit the following:

1. Manufacturer's specifications for all plastic faced doors.
2. Certified test reports for STC-rated plastic faced doors.

C. Certificates: Submit certificates by each door manufacturer that doors supplied conform to or exceed requirements of these Specifications.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements: Window and Door Manufacturers Association I. S. 1A (WDMA) Standards for Architectural Wood Flush Doors. Furnish doors for labeled openings, where indicated or scheduled, in accordance with manufacturer's procedures filed with and approved by UL. Provide UL labels on door hinge stile. Equip pairs of labeled doors with stainless steel astragals unless astragals are supplied under Section 08710 or the pair of plastic faced doors is a tested assembly that does not require astragal and is installed with hardware conforming to label approval.

B. Tolerances: Provide pressure laminate faced doors having maximum 1/8" gap between top and side edges of wider door face and frame after installation, and maximum 1/4" clearance above finish floor except as otherwise required by floor finish material; provide maximum 1/8" gap between door edges at the meeting stiles of pairs of doors.

C. Rejected Doors: Furnish new doors conforming to the requirements of this Section as replacements for doors rejected because of damaged surfaces, improper fitting or hardware preparation, or other cause, at no extra cost to the Owner. Patching will not be permitted for correction of defects.

1.04 WARRANTY: Refer to Section 01740. Furnish to Owner a written warranty, subject to provisions of the WMDA "Standard Door Guarantee", covering defects in door materials and workmanship for the lifetime of the installation.

PART 2 - PRODUCTS

2.01 HIGH PRESSURE LAMINATED FACED DOORS: WDMA I.S. 1A Quality, Grade Premium, Type PC-HPDL-3 and FD-HPDL-5. Solid core bonded construction type by one the following manufacturers subject to conformance with requirements shown or specified; refer to Section 01630 for substitutions: Algoma Hardwoods, Buell, or VT Industries.

A. Cores: Provide doors with solid particleboard cores of minimum 28 pcf density conforming to ANSI A208.1, Grade 1-LD-2, hot press resin bonded. Provide solid wood lock blocks; provide 5 inch top rail solid blocking on doors to receive closers. For UL label and 20-minute labeled doors, provide the manufacturer's standard cores necessary for UL label and California SFM approval.

B. Stiles and Rails: Provide structural composite lumber (SCL) with matching face outer edge stiles and rails pressure laminated to provide minimum 1-3/8" wide (before pre-fitting) stile and rail edges. The outer stile shall be applied after beveling and prior to face application. Laminate stile edges to particleboard core prior to application of face laminate. Fire-retardant treat stiles and rails when required for UL or California SFM approvals.

C. Crossbanding: At 60 and 90 minute rated fire doors provide door manufacturer's standard crossbanding of at least 1/16" thick high density fiber, fully bonded to core with water-resistant adhesive conforming to Fed Spec MMM-A-188, laminated by the hot plate process.

D. Surfacing: Provide high pressure laminate facing, 0.050" to 0.0625" thick, and edge surfacing of minimum 0.050" thick plastic laminate that meets or exceeds the requirements of NEMA LD3 for general purpose high pressure decorative plastic laminates, 1-piece on each face. Cover vertical edges of doors with pressure laminate and provide a 2-coat factory enamel finish on top and bottom edges after pre-fitting.

E. Adhesive: For bonding of plastic laminates, use a hot-pressing resorcinol type adhesive conforming to NEMA LD3.1.

2.02 UL LABELED PLASTIC FACED DOORS: Matching finish and appearance of other laminate faced doors, conforming to UL re-examination label requirements for the rating scheduled. Conform to UBC 7-2 / UL-10C positive pressure fire label requirements for rating scheduled, bearing required UL or WHI label on hinge stile or top rail. Door manufacturer shall construct from appropriate particleboard or non-combustible mineral core, structural composite lumber stiles and rails, with concealed intumescent seals, meeting fire door label requirements. No intumescent seal is allowed on frame. Provide UL or WHI listed astragals for pairs of doors.

2.03 GLAZED LIGHT FRAMES: For plastic faced doors, labeled and non-labeled, bearing UL and California SFM listing and approval, equal to "Anemostat-West FGS-75" steel glass stops, of stainless steel having satin texture directional finish and matching fasteners.

2.04 DOOR LOUVERS: Inverted chevron units with straddle type frames, stainless steel of welded construction, Air Louvers Ltd 600-A, Anemostat-West CHDL-2F, or equal, exposed stainless steel having a satin texture directional finish and matching fasteners.

2.05 ASTRAGALS: Provide stainless steel astragals for meeting stiles of pairs of doors including labeled doors.

PART 3 - EXECUTION

3.01 FACTORY PREPARATION OF DOORS: Pre-fit and pre-machine all plastic faced doors for hardware at factory or mill.

A. Pre-fitting: Conform to WMDA I.S.-1A, unless otherwise detailed, lock stiles beveled to conform to hardware.

B. Hardware Preparation: Factory prepare laminate faced doors to receive all mortised door hardware furnished under Section 08710, including hinges and pilot holes for hinge screws. Obtain necessary templates from finish hardware supplier, and coordinate placement with hollow metal frame supplier so doors and frames are properly fitted and equipped after installation, maximum 3/64" tolerance allowed in placing hardware.

C. Sealing: At door factory, seal all cut-outs, mortises, and openings in laminate faced doors with two coats of clear resin sealer.

3.02 INSTALLATION: Refer to Division 6, Section 06200.

END OF SECTION

SECTION 08310

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide access doors and panels as indicated and required. Refer to Section 09100 regarding installation of access door and panels. Coordinate with requirements of Divisions 15 and 16 to avoid duplication.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit for each type of access door and panel.

1.04 QUALITY ASSURANCE: Manufacture labeled access panels in accordance with specifications of UL. Panels shall have UL listing and label when delivered to job site.

PART 2 - PRODUCTS

2.02 ACCESS DOORS AND PANELS: Inryco/Milcor; Style K at plaster; Style DW for wallboard finish; Style M - Standard at masonry; Style M - Stainless at ceramic tile; Style AP or AT as required at ceilings, or equal by Karp. For 2-hour fire-rated walls, provide fire rated access doors bearing UL 1-1/2 hour fire-resistive label, and of stainless steel where in tiled or stone surfaces.

PART 3 - EXECUTION

3.01 INSTALLATION: Set panels accurately in location, in perfect alignment, plumb, straight and true. Brace to prevent displacement. Coordinate location of panels with the trades that require panels. Examine panels when installed for proper opening, closing and clearances. Replace damaged panels and those that are not in proper working order.

END OF SECTION

SECTION 08332

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide coiling metal doors, complete.

A. Related Work:

1. Structural supports for doors.
2. Finish painting, except as specified in this Section.
3. Electrical services and wiring.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Submit Shop Drawings with Product Data covering all Work of this Section.

1.03 PROJECT CONDITIONS: Verify all measurements and field conditions at the site prior to submittal of Shop Drawings and fabrication. Coordinate with the Work of Division 13.

PART 2 - PRODUCTS

2.01 MANUFACTURE: Specifications are based on products of the Cookson Company to establish the intended types and qualities. Equivalent products of Mahon, Lawrence, Kinnear, Cornell, Jim Walter Doors, Overhead Door Corp., J.G. Wilson, Windsor, or Pacific Rolling Doors are acceptable.

2.02 MOTOR-OPERATED SERVICE DOOR: Cookson Type FCM with belt drive motor operator as required by door size and gage, correct operator mounting for installation conditions and equipped with an emergency chain operator, and No. 4 galvanized bonderized steel curtain slats. Provide end locks, galvanized steel guides and hood, operating and counterbalancing devices, and "Detectedge" device on bottom bar. Furnish an exterior weatherproof keyed station with open, close, and neutral positions for the door, and three keys. Include complete weatherstripping and wind locks.

2.03 ELECTRICAL COMPONENTS AND CONTROLS: Provide electrical items conforming to Code and UL Bulletin 325, including constant pressure down circuit unless the door is equipped with a conforming door safety device.

2.04 FACTORY PRIMING: Provide door manufacturer's standard baked-on metal primer or enamel paint on galvanized surfaces and operating devices to be field painted, except as otherwise specified.

2.05 FACTORY PAINTING: Coiling door assemblies in the exterior walls of the building shall have all surfaces visible on the building exterior, including curtain, hood, and guides, fluoropolymer paint finished in accordance with Section 05080, including submittals and warranty, color designated by the Architect.

PART 3 - EXECUTION

3.01 INSTALLATION: Employ an authorized representative of the door manufacturer to install doors in accordance with door manufacturer's printed recommendations and approved submittals. Produce secure completed installations that operate freely without bind or stoppage. Touch-up all damaged or abraded primed surfaces after erection. Touch up and acceptably repair damaged fluoropolymer paint finish in accordance with Section 05080.

END OF SECTION

SECTION 08410

ENTRANCES, STOREFRONTS, AND WINDOWS

PART 1 - GENERAL

1.01 SUMMARY:

A. Work Included: Under the "Design-Build Procedure" (refer to Section 01150, provide aluminum entrance doors and frames, aluminum framed window walls and windows, and aluminum-framed tempered glass entrance doors, complete, including:

1. Aluminum window walls.
2. Aluminum entrance doors and frames.
3. Fixed aluminum windows framed with aluminum storefront type frames.
4. Factory finish on aluminum surfaces.
5. Decorative fins and sloping canopies as detailed.
5. Calking and sealing.
6. Installation of hardware for aluminum entrance doors.

B. Related Work:

1. Furnishing finish hardware for aluminum entrance doors.
2. Glass and glazing.
3. End closures for wallboard partitions abutting window walls.

1.02 SYSTEM DESCRIPTIONS:

A. Provide 2" aluminum mullions for typical exterior windows and window walls, sizes indicated.

B. Ground floor windows, not including main lobby, shall 2" x size indicated. System shall meet all current Title 24 CCR requirements for energy performance and air infiltration, water infiltration, and seismic requirements.

C. All Ground Floor aluminum and glass doors shall have 4" stiles and rails except at the bottom where the dimension shall be 10".

D. Wall elements shall be 2" wide and as deep as required to meet structural needs though in no case to exceed 8".

E. Ornamental fin construction and sloping canopies shall be as detailed, and finished with pre-painted panels as noted.

F. Exterior aluminum mullions and aluminum doors shall have a fluoropolymer paint finish in accordance with Section 05080.

1.03 SUBMITTALS:

A. Product Data: Submit for all products and systems specified in this Section or furnished under other Sections for installation under this Section.

B. Shop Drawings and Calculations: Submit for all Work of this Section, prepared and approved prior to fabrication. Show complete details for all materials, finishes, sizes, profiles, moldings, dimensioned locations of hardware items with reinforcement, methods of anchoring, assembly, erection, internal drainage, isolation, glazing and reglazing procedures and materials, and calking. Include the manufacturer's technical and structural

data. Include complete structural calculations showing that materials proposed for use conform to deflection requirements specified in Paragraph "Performance Standards", signed and sealed by qualified structural engineer registered in California.

C. Samples: Submit the following Samples and such other Samples as are required for approval of Work of this Section:

1. Window wall, fixed aluminum windows, and aluminum sections for aluminum entrance doors and frames with specified paint finish, corner and intersecting jointing construction, fasteners, and accessories.
2. Resinous paint finished panels and members.
3. Decorative fin and sloping canopy construction sample panels showing jointing and finish.
4. Cured sealant colors.

D. Conformance Data: Submit satisfactory evidence and copies of test records demonstrating proposed window walls and entrances, when installed and glazed, conform to requirements of Article "Quality Assurance" including the performance standards therein.

E. Full-Size Glass Samples: Refer to Section 08800.

1.04 QUALITY ASSURANCE:

A. Quality Standards: In addition to Code, provide Work of this Section so designed that glass installations conform to ANSI Z97.1, as applicable, and to Federal Safety Standard 16 CFR 1201.

B. Performance Standards: Provide all Work of this Section so designed that, when installed and glazed, the construction conforms to following performance criteria:

1. Thermal Movement and Clearance: System provides for thermal movement within surface temperature range of +10 to +190 deg F, with additional clearance allowed for erection tolerance, slab and beam deflections, and long term creep of the building structural frame.

2. Air Infiltration: When any storefront window wall system and fixed aluminum windows is tested according to ASTM E283, air infiltration at perimeter of operating doors does not exceed 0.25 cubic feet per minute per foot of sash perimeter with total air infiltration from all other sources, including fixed doors and windows, not over 0.06 CFM per square foot of wall area. In calculating wall area, areas of operating doors and windows are not included.

3. Water Infiltration: Includes uncontrolled water on the interior face of any part of any window wall or fixed windows other than condensation. System design shall include provisions to drain to the exterior water leakage occurring at joints and/or condensation taking place within wall or window framing system construction, with drainage weeps open during tests.

a. Static Pressure: No water infiltration when the construction is tested per ASTM E331 at differential static pressure of 7.5 PSF.

b. Dynamic Pressure: No water infiltration when the construction is tested per AAMA 501.1 at 7.5 PSF pressure and 80 MPH slip stream velocity.

4. Structural Properties: Deflection of members does not exceed 1/175 of span under a design load of 35 PSF acting inward and outward normal to the plane of the wall, members using allowable stress with safety factor of 1.65 minimum.

C. Reference Sections: Requirements specified in Section 07920 and Section 08800 are a part of this Section, including submittal and warranty requirements.

1.05 PROJECT CONDITIONS: Protect all the Work of this Section until completion and final acceptance of the entire Work. Repair or replace all damaged or defective Work to original specified condition at no additional cost to Owner. Damaged or defective Work includes surfaces which cannot be acceptably cleaned or repaired.

1.06 WARRANTIES: Conform to Section 01790 and the following.

A. Aluminum Window Walls and Fixed Aluminum Windows: Warranty all for 5 years. Warranty shall guarantee to replace or repair defective materials or workmanship for entire warranty period, including frames for all types of entrance doors provided under this Section. Defective materials and workmanship include abnormal deterioration, aging or weathering of Work, water or air leakage exceeding specified limits, structural failure of any component as result of exposure to pressures and forces up to specified limits, failure of operating parts to function normally, deterioration or discoloration of applied finishes in excess of allowable limits, glass breakage and secondary glass damage or breakage due to falling glass fragments, failure of sealants, or failure of the construction to fulfill other specified performance requirements. Warranty does not cover damage due to vandalism or natural conditions exceeding the performance requirements; however, warranty does include failures or defects for which a cause cannot be determined. This warranty and its enforcement shall not deprive the Owner of other action, right, or remedy available to the Owner.

B. Entrance Doors: Warranty aluminum framed entrance doors against sagging or twisting of doors as a result of normal usage for 5 years minimum.

C. Glass and Glazing: Warranty in accordance with Section 08800.

D. Paint Finish: Furnish to the Owner a written warranty for 20 years as specified in Section 05080.

E. Calking and Sealants: Warranty in accordance with Section 07920.

PART 2 - PRODUCTS

2.01 TYPES: Provide for thermal movement through the surface temperature range specified in Paragraph "Performance Standards" above. Details shown establish required sizes, types, and appearance.

A. Manufacture: Minor modifications in non-essential details to accommodate manufacturer's standard sections of same sizes, profiles, and glazing features indicated are acceptable, subject to approval.

B. Members: Provide complete as indicated and required, including all glass setting bars, transom bars, trim, mullions, and door frames. Provide necessary setting accessories, including screws, fittings, and anchors. Design all joints and connections for flush watertight hairline fitting and to allow for structure and thermal movement and deflections without loss of glass edge clearance, grip, or watertight integrity.

C. Wind Load and Deflection: Provide all aluminum members of section thickness and structural properties, minimum 3.2 mm thickness wherever stressed and 1.6 mm thickness elsewhere, all designed to withstand Code required wind loadings without buckling, distortion, or distress, and with maximum deflection of 1/175 of the unsupported length, except minimum 20 pounds per square foot wind loading where Code allows lesser load. Provide additional bent plate or rolled steel internal stiffeners where necessary to meet deflection requirements. Pre-coat stiffeners with a heavy bituminous coating to electrically isolate from aluminum. Conform glass edge bearings, laps, and clearances to Code, but minimum 13 mm glass bite in any case for glass retained by metal stops.

D. Fasteners: Place no fasteners on exposed surfaces unless approved on the Shop Drawings, exposed fasteners with flat Phillips head and finished to match adjoining surface.

E. Slip Pads: Eel slip, nylatron, high impact polystyrene, or equal, between moving parts at expansion connections, minimum 1/8" thick. Do not use nylatron in close proximity to a field weld.

F. Drainage: Provide inconspicuous weep holes or equivalent method to ensure positive drainage of internal moisture or condensation to exterior, weep holes protected from blow-back by 45 PPI open cell retriculated foam filter compressed 50% to 60% of loose volume. Detail in Shop Drawings.

G. Miscellaneous Items: Provide all extruded aluminum drywall adapter trims, ceiling and wall trims, sills, covers, closures, and similar items indicated or required for complete installations; fully detail in Shop Drawings.

H. Aluminum Entrance Doors: Medium stile type with water-repellent treated mohair or equivalent weatherstripping in aluminum retainers on all four edges, bottom rail height meeting handicapped requirements of regulatory agencies. Overhead Coiling Doors

I. Hardware Preparation: Provide factory-applied concealed reinforcement for hardware in entrance doors and frames, minimum 3/16" thick aluminum. Cut, mill, reinforce, drill, and tap rails and reinforcements for application of the finish hardware from templates furnished by the hardware supplier.

2.02 ALUMINUM FINISH: For all exposed aluminum surfaces, provide fluoropolymer paint finish in accordance with requirements of Section 05080, 20 year warranty. Warranty resinous paint finish on panels for the same warranty period.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS: Conform to approved submittals and the other requirements herein.

A. Aluminum Isolation: Isolate aluminum from dissimilar metals and materials other than non-magnetic stainless steel. At metals, apply on both contacting surfaces a heavy brush coat of zinc chromate primer made with a synthetic resin vehicle, followed by two heavy brush coats of spar varnish based aluminum metal and masonry paint; or apply a heavy coat of alkali-resistant bituminous paint; or separate the surfaces with non-absorptive exterior quality polyvinyl chloride tape or gasket, or coat both surfaces with a fluid-applied neoprene or urethane membrane material. Coat both contact surfaces with alkali-resistant bituminous paint at concrete, masonry, plaster, tile, and cementitious materials. Conceal all isolation in the finished Work.

B. Calking: Provide calking and sealants as shown and required to make all Work of this Section watertight and properly finished, including joints between aluminum frames and adjoining Work. Install sealants of selected and approved colors. Conform to Section 07920 including warranty.

3.02 INSTALLATION: Member or miter framing member joints with hairline sealed joints. Securely anchor to the building structure. Set frames level, plumb and in true alignment. Construct completely waterproof assemblies.

3.03 HARDWARE: Install finish hardware on entrance doors according to hardware manufacturer's instructions and installation templates, and adjust all items for correct operation. Set thresholds in sealant.

3.04 FIELD QUALITY CONTROL:

A. Inspection: Shop and field materials and workmanship may be inspected by the Engineer at any time. Such inspection does not relieve the Contractor from the obligation to provide materials and construction conforming to Contract Documents and approved submittals, and Contractor shall correct all deficiencies reported and shall effect quality control measures and procedures for materials, whether or not inspected.

B. Field Water Tests: To the extent directed, perform field water tests on the completed and glazed parts of Work of this Section according to AAMA 501.2 (modified to exclude the appearance of any water at the interior). If tests result in uncontrolled leakage, eliminate causes of the leakage at no extra cost to the Employer and retest all repaired areas. Remedial measures shall maintain quality and performance standards all subject to approval. Contractor shall furnish powered scaffolds, hoses, water, and personnel required to perform the tests.

3.05 COMPLETION: Wash all soiled surfaces with mild soap solution, rinse with clear water, and wipe dry. Do not use harsh cleaning agents, abrasives, or caustics for cleaning. Leave Work free of dirt, streaks, and labels.

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Furnish finish hardware, complete. Extent of finish hardware required is indicated on the Drawings, in Schedules, and specified herein.

A. Work Included: Types of finish hardware required include but are not limited to the following:

1. Hinges.
2. Continuous hinges.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Bolts.
6. Exit devices.
7. Push/pull units.
8. Closers.
9. Door trim units.
10. Weatherstripping for exterior doors.
11. Smoke seals for interior doors.
12. Astragals or meeting seals on pairs of doors.
13. Thresholds.
14. Magnetic holders.

B. Items Not Included:

1. Installation of the finish hardware.
2. Cabinet hardware.
3. Bath accessories.
4. Nameplates, room numbers exit signs.
5. Handicapped signs.
6. Roll-up door hardware, except cylinders.
7. Smoke detectors, 120VAC power, wiring, conduit.
8. Automated folding door hardware.
9. Wiring and conduit for closet light switches.

C. Related Sections:

1. Section 06200 - Finish Carpentry: Installation of finish hardware.
2. Section 08110 - Steel Doors and Frames: Preparation for and coordination with finish hardware.
3. Section 08210 - Wood Doors: Preparation for and coordination with finish hardware.
4. Section 08410 – Aluminum/Glass Doors and Frames.
5. Division 16 - Addressable Life Safety Fire Alarm Systems: Provision of electrical power and signal services to a hardware device activated by the fire alarm system.
6. Divisions 13 and 16 - Alarm and Access Control System: Power and wiring for electronic door hardware; installation of magnetic switches; integration of electronic finish hardware into alarm and access control system.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Inspection of Existing Conditions: Prior to developing the submittal, perform a detailed door-by-door survey of the existing doors and/or frames to remain. Perform a field-verification of existing door and frame preparations, and of existing hardware (as required by the hardware sets). Confirm the compatibility of the specified hardware with the existing conditions. Should incompatibilities be discovered, advise of such in the hardware submittal and provide suggested solutions.

B. Product Data: Submit the manufacturers' technical product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finishes.

C. Hardware Schedule: Submit a vertical format hardware schedule in a manner indicated below. Coordinate hardware with the doors, frames, and related Work to ensure proper size, thickness, hand, function, and finish of hardware.

1. Final Hardware Schedule Content: Based on finish hardware specified, organize a hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

a. Type, style, function, size and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and a frame schedule.
e. Explanation of all abbreviations, symbols, codes, etc. contained in a schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.
h. Keying information.

2. Submittal Sequence: Submit the schedules at an earliest possible date, particularly where acceptance of a hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with a schedule the Product Data, Samples, Shop Drawings of the other Work affected by finish hardware, and other information essential to the coordinated review of a hardware schedule.

3. Keying Schedule: Submit a separate detailed schedule indicating clearly how the Owner's final instruction on keying of locks has been fulfilled.

4. Samples: Prior to submittal of the final hardware schedule, submit one Sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with a schedule.

a. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

5. Templates: Furnish hardware templates to each fabricator of doors, frames, and other Work to be factory-prepared for the installation of hardware. Check Shop Drawings of such other Work, to confirm that adequate provisions are made for proper location and installation of hardware.

6. Door and Frame Clearances: Where continuous hinges are scheduled, furnish door and frame suppliers with information on required special clearances.

1.03 REGULATORY REQUIREMENTS:

A. Code References:

1. California Building Code (CBC).
2. National Fire Protection Association (NFPA) Fire Doors and Windows Code 80, 1991 Edition.
3. Part 2, Title 24, CCR including all current amendments.
4. Life Safety Code 101 NFPA (1988).
5. American with Disabilities Act (ADA) of 1990 criteria.

B. Exit Doors: Shall be openable from the inside with non-grip openable hardware that does not require the use of a key or any special knowledge or effort.

1.04 QUALITY ASSURANCE:

A. Manufacturer: Obtain each type of hardware as differentiated in this Section's "Manufacturers" list from a single manufacturer, although several may be named as offering products meeting the requirements.

B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than two years, and who is, or who employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the Work, for consultation about project's hardware requirements to the Owner and Contractor.

C. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NAPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or WHI for types and sizes of doors required and complies with requirements of door and door frame labels. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or WHI labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or WHI labels on exit devices indicating "Fire Exit Hardware".

1.05 PRODUCT HANDLING:

A. Tag each item or package separately, with identification related to a final hardware schedule, and include basic installation instructions with each item or package.

B. Inventory hardware jointly with representatives of a hardware supplier and hardware installer until each is satisfied that count is correct.

C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project sites) for installation.

D. Provide secure lock up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the Work will not be delayed by hardware losses, both before and after installation.

1.06 WARRANTY: Conform to Section 01790. The following extended warranty service shall be furnished for the hardware items detailed below. Defects in materials and workmanship occurring during the warranty period shall be corrected to complete satisfaction of the Owner:

A. Hinges: Warranted for the life of the building.
B. Floor closers: Minimum ten (10) years mechanical.
C. Exit devices: Minimum three (5) years.
D. Other hardware: Minimum two (2) years.

1.07 TOOLS AND MAINTENANCE INSTRUCTIONS FOR MAINTENANCE: Conform to Section 01770. Furnish a complete set of specialized tools and maintenance instructions as needed for the Owner's continued adjustment, maintenance, and removal and replacement of finish hardware. Deliver to the Owner as specified in Section 01770.

PART 2 - PRODUCTS

2.01 SCHEDULED HARDWARE: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are covered in the Finish Hardware Data Sheet and specified in the Hardware Schedule at the end of this Section.

A. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required. Provide the product designated either, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in this Section.

2.02 MATERIALS AND FABRICATION:

A. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

B. Base Metals: Produce hardware units of basic metal and the forming method shown using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI Al 56.18 for finish designations specified. Do not furnish "optional" materials or forming methods for those specified, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically specified.

1. Furnish screws for installation, with each hardware item. Provide Phillips flathead screws unless otherwise specified. Finish exposed (exposed under any condition) screws to match hardware finish or, if

exposed in surfaces of other Work, to match finish of such other Work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

2. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners.

3. Do not use thru-bolts for installation where bolt head on opposite face is exposed in other Work, except where it is not feasible to adequately reinforce the Work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

4. Provide stainless steel 1/4-20 machine screws (finished to match thresholds) and anchors for thresholds to be installed over concrete floor material.

2.03 HINGES:

A. Templates: Except for hinges to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Furnish Phillips flathead or machine screws for installation of units, except furnish Phillips flathead or wood screws for installation of units into wood. Finish screw heads to match surfaces of hinges or pivots.

C. Hinges:

1. Number of hinges: Provide number of hinges specified but not less than three hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.
2. Furnish 4-1/2" x 4" hinges, except at the following door widths or thicknesses:
   a. Standard Weight 5" x 4" at doors 3'-6" and wider.
   b. Heavy Weight 5" x 4" at doors 4'-0" wide and at doors weighing more than 150 lbs.
   c. Standard Weight 4" x 4" at doors thinner than 1-3/4".
3. Furnish hinges of sufficient width to permit maximum door swing.
4. Furnish heavyweight hinges where specified.
5. Furnish steel-base hinges at doors rated 20-minutes or above.
6. Furnish with non-removable pins at all interior and exterior outswing doors; furnish with security studs at all exterior outswing doors.

2.04 LOCK CYLINDERS AND KEYING: Hardware suppliers shall meet with the Owner to finalize keying requirements and obtain final instructions in writing.

A. Keying System: All cylinders shall be furnished grand master keyed to the existing Sargent key system. Hardware supplier shall develop key system according to the requirements of this Section and coordinate with the Owner, prior to placing the factory lock order.

B. Metals: Construct lock cylinder parts from brass/bronze, stainless steel, or nickel silver.

C. Keys: Comply with the Owner's instructions for master keying and, except as otherwise specified, furnish individual change key for each lock not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with a number or code that identifies the cylinder manufacturer's key symbol, and notation "DO NOT DUPLICATE".

D. Construction Masterkey System: Furnish with temporary construction masterkeys shipped with locksets and cylinders. On completion of the Work, the Contractor shall collect all construction keys and in the presence of the Owner, shall void the construction key system and demonstrate the permanent key system is functional.

E. Key Material: Provide keys of nickel silver only.

F. Key Quantity: Furnish three change keys for each lock; with maximum of 10 change key and five master keys for each master; 5 grand master keys for each grandmaster system; and six great grand master keys. Furnish 50 construction masterkeys.

G. Cylinder Accessories: Furnish cylinder collars and spacers as needed to meet conditions.

2.05 LOCKS, LATCHES, AND BOLTS:

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frames, finished to match hardware set.

B. Lock Throw: Comply with UL requirements for a throw of bolts and latch bolts on rated fire openings.

C. Security Locksets: Shall be Adams Rite MS1850S Series. Provide appropriate backset so lock body fits in center of door stile, coordinate with door supplier.

D. Backset: Unless noted otherwise, provide 2-3/4 inch backset.

2.06 PANIC EXIT DEVICES:

A. Where specified, provide panic exit device with required UL labels. Where panic device is required on fire rated doors, provide UL label with supplementary marking on door and hardware indicating compliant fire exit hardware.

B. Provide modern push-pad type, reversible exit devices with precision cold forged steel chassis and stainless steel latch cover, touchbar and end cap.

C. Push-pad shall be mounted at a height of not less than 30 inches (762mm) nor more than 44 inches (1118mm) above floor. The unlatching force shall not exceed 15 pounds (66.72N) when applied in the direction of travel per CBC 1133B.2.5.

D. Exit Devices shall comply with UBC standard 10-4 and CBC 1003.3.1.9.

2.07 CLOSERS:

A. Type: Modern surface mounted closers shall be full rack and pinion type with pressure cast alloy shell, with no more than 2-1/8" projection from the door surface.

1. Provide drop brackets, mortise shoes, long arms and low profile arms as required. Parallel, regular arm, and top jamb closers shall be capable of 180 degree swing.
2. Provide non-handed door closers with non-sized springs, with separate adjustable valves for a latch, sweep speed, and back check.
3. Spring power shall be adjusted closers per the manufacturer's recommendations and to meet barrier free requirements.
4. Closers shall have full spring power adjustment, two to six spring adjustments on exterior and fire doors, and one to four adjustments on interior doors.
5. Mount surface closers on side of door away from corridor, inside rooms, or in stairs. Provide regular, parallel, or top jamb mount closers as required.

B. Access-Free Manual Closers: Where manual closers are specified for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 and ADA provisions for door opening force and delayed action closing.

C. Plated Closers: Where plated closers with metal covers are specified, furnish with plated cover and arm.

D. Floor concealed closers shall be Rixson models with fully adjustable spring power, available for physically handicapped access. Provide selective (On-Off) hold-open valve.

1. Provide closer with independent exposed valve adjustments for closing speed, latch speed, delayed action closing and back check.
2. Provide overhead concealed stop-holder package from manufacturer with closer and stop-holder factory coordinated to dead stop at the same degree.

2.08 DOOR TRIM SETS:

A. Fasteners: Provide manufacturers' standard exposed fastener for door trim units (kick plates, edge trim, viewers, and similar units); either machine screws or self-tapping screws.

B. Protection Plates: Fabricate with beveled edges (armor, kick, or mop) not more than 2" less than door width on a stop side and by the height specified.

1. Metal Plates: Dull stainless steel --- 0.050" (US 16 gage).
2. Plastic Plates: Clear --- 0.175" (1/8 inch)

2.09 MAGNETIC HOLDERS: Furnish magnetic holders with tri-volts coils only. Furnish assemblies consisting of an armature contact plate with adjustable mounting pivot. Use 900 series extension as necessary to lined door at 90 degrees with wall.

2.10 STOPS: Furnish carpet risers for floor stops where required. Where specified floor or wall stops would present a pedestrian hazard or cannot be used, furnish an overhead stop or provide a closer with an integral spring-cushion stop as appropriate. Furnish concealed overhead stops where this would not conflict with the door and frame fire-rating or other hardware. Mount surface overhead stops on side of door away from corridor, inside rooms, or in stairs; provide accessory brackets as required.

2.11 SILENCERS: Furnish Don-Jo 1608 at hollow metal frames and Don-Jo 1609 at wood frames that are without seals in the quantities as follows: single doors --- 3 silencers; pairs 2 silencers.

2.12 SEALS AND GASKETING: Except as otherwise indicated or specified, provide continuous weather-stripping at each edge of every exterior door leaf. Provide type, sizes, and profiles shown or scheduled. Provide stainless steel fasteners for extruded seals. Furnish adhesive silicon seals at all labeled interior doors and doors that require sound stripping. Where Pemko 2891 seals are specified at frames with narrow stops, furnish factory-cut for frame stop and re-drilled.

A. Intumescent Seals: At wood doors rated 20-minutes or above that do not have integral intumescent seals by the door manufacturer, in addition to adhesive silicon seals, furnish intumescent seals for head and jambs and for meeting stile at pairs in lieu of the specified astragal.

2.13 THRESHOLDS: Except as otherwise indicated or specified, provide standard metal threshold units of types, sizes, and profiles as shown or scheduled. Where required by fire code, furnish appropriate model thresholds at openings where combustible floor material extends through the door opening. Thresholds must comply with the requirements of ADA and ANSI-117.1 and CBC section 1133B.2.4.1

2.14 HARDWARE FINISHES: The designations used in schedules and elsewhere to indicate or specify hardware finishes are those listed in ANSI A156.18 "Materials and Finishes Standard", including coordination with the traditional US finishes shown by certain manufacturers for their products.

Dull Chrome Plated (US26D, 626)
Dull Chrome Plated—Steel (US26D, 652)
Satin Stainless Steel (US32D, 630)
Clear Anodized Aluminum (US28, 628)
Milled Aluminum (628) (719)
Prime Coat for Paint (600)
Sprayed Aluminum (689)
Grey (GRY)
Brown (BR)

A. Coordinators: Where coordinators are specified in 628 (US28) finish, if not available in that finish, furnish clad in polished chrome 625 (US26).

2.15 MANUFACTURERS: Substitution requirements are specified in Section 01630 of Division 1, with Owner's written approval only. Where listed "As Specified", there is no substitute.

Item	Listed	Approved Mfr.
Hinges	MCK-McKinney	Stanley, Hager
Continuous Hinges	MAR-Markar	McKinney, Stanley
Heavy Duty Hinges	BRO-Brookfield Industries	As Specified
Flush Bolts, Coordinators	DCI-Door Controls Int'l	Hager, Ives
Lock Cylinders	MED-Medeco	As Specified
Locks	SCH-Schlage	Corbin Russwin
Latches	ARM-Adams Rite	CR Laurence
Closers	NOR-Norton	Yale, LCN, Sargent
Floor Closers	RIX-Rixson	As Specified
Kick & Mop Plates	DJM-Don-Jo Mfg.	Rockwood, Trimco

Item	Listed	Approved Mfr.
Stops	DJM-Don-Jo Mfg.	Rockwood, Trimco
Magnetic Holders	RIX-Rixson	Norton. LCN
Thresholds	NGP-National Guard	Zero, Pemko
Seals	NGP-National Guard	Zero, Pemko

2.14 FINISH HARDWARE SCHEDULE: See end of the preamble. Any obvious error in hardware groups shall be called to the attention of the Architect for clarification prior to bidding.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to the Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected. Verify that doors and frames are ready to receive the hardware and dimensions are as shown on the Shop Drawings, instructed by manufacturer. Beginning of hardware installation means acceptance of existing conditions.

3.02 INSTALLATION: Install hardware in accordance with manufacturer's instructions and requirements of SDI, ANSI/N FPA 80, WIC, and BHMA. Select the applicable standard based on door function, type, and regulatory criteria. Install hardware in accordance with NFPA 80 in fire labeled doors. Where door is designated as receiving new hardware, package and label hardware type and function, and deliver to the Contractor.

3.03 TEMPLATES: Install hardware using the templates furnished by the hardware manufacturer. Before finishing the door, fit hardware to the door, utilizing fasteners and templates as specified. Remove hardware, carefully label, and store. Re-install after door finish is complete.

3.04 PLACEMENT: Unless noted otherwise or shown on Drawings, mount hardware in accordance with the following criteria:

A. Latchset and lockset handle --- 38" above finish floor; verify manufacturer's template with door design.
B. Panic devices --- 36" to 40" above floor; verify manufacturer's template with door design.
C. Push and pull plates --- 44" to centerline.

3.05 CLOSING FORCE: Adjust closer operating effort to conform to California Building Code Section 10, 1-24 OCR.

A. Interior and exterior doors --- 5.0 pounds force.
B. Fire rated doors --- 15.0 pounds force.

3.06 DELAY AND SWEEP: Adjust the closer delay and operating speeds to comply with the requirements of California Building Code T-24 and the ADA Architectural Guidelines, Article 4.13.10. Sweep period of door closers shall be 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 latch, measured to the leading edge of the door.

3.07 THRESHOLDS: Install in full bed of sealant at front and side edge.

3.08 CLEAN AND ADJUST: At completion, all hardware shall be left clean and free from disfigurement. Contractor shall make a final adjustment to all door closers and other items of hardware. Where hardware is found defective, repair, replace, or otherwise correct as directed. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Adjust hardware so that moving parts operate freely, without bind, or excessive play. Hardware shall be free of paint, corrosion, or damage of any kind.

3.09 FINISH HARDWARE SCHEDULE:

HW-1

Exterior Back Entry
Each Roll-up Door to Have: (M x M) NR

1	Cylinder/Padlock	As Require	626	MED
1	Alarm Contact	2207AH By Security		

Balance of hardware by door mfr.
Notes: Conduit and wiring by Division 13/16.

HW-2

Exterior Back Entry
Each Door to Have: (HMD x HMF)

			NR	
1	Cont Hinge	(2)HT-FM300	630	MAR
1	Lockset	L9060P-17A	630	SCH
2	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Latch Guard	MLP111	630	DJM
1	Closer	(P)8501H-DA	689	NOR
1	Kick Plate	90	630	DJM
1	Floor Stop	1520	626	DJM
1	Threshold	425 ¼ -20 SS-MS&LA	710	NGP
1	Door Bottom	C627A	628	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP
1	Alarm Contact	1076D By Security		

Notes: Conduit and wiring by Division 13/16.

HW-3

Exterior, Roof
Each Door to Have: (HMD x HMF)

			NR	
3	Hinges	TA3386 4-1/2 x 4 NRP-SSF	630	McK
1	Lockset	L9080P-17A	630	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Latch Guard	MLP111	630	DJM
1	Closer	(P)8501	689	NOR
1	Floor Stop	1449	626	DJM
1	Threshold	425 ¼ -20 SS-MS&LA	710	NGP
1	Door Bottom	C627A	628	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP
1	Alarm Contact	1076D By Security		

Notes: Conduit and wiring by Division 13/16.

HW-4

Exterior Stair Roof
Each Door to Have: (HMD x HMF)

			NR	
2	Hinges	TA3386 4-1/2 x 4 NRP-SSF	630	McK
1	Power Transfer Hinge	TA3386-CC 4-1/2 x 4 NRP-SSF	630	McK
1	Electric Lockset	L9080P-EL-17A	630	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Latch Guard	MLP111	630	DJM
1	Closer	(P)8501	689	NOR
1	Floor Stop	1449	626	DJM
1	Threshold	425 ¼-20 SS-MS&LA	710	NGP
1	Door Bottom	C627A	628	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP
1	Alarm Contact	1076D By Security		

Notes: Conduit and wiring by Division 13/16.

HW-5

Exterior Stair
Each Door to Have: (HMD x HMF)

			NR	
1	Cont Hinge	(2)HT-FM300	630	MAR
1	Exit Device	98L-17	630	VD
1	Cylinder	32(W)-0400-7Pin	626	MED
1	Closer/Stop	CLP8501T-DA - 110° Stop	689	NOR
1	Kick Plate	90	630	DJM
1	Threshold	425 ¼-20 SS-MS&LA	710	NGP
1	Door Bottom	C627A	628	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP
1	Alarm Contact	1076D By Security		

Notes: Conduit and wiring by Division 13/16.

HW-6

Entry Doors
Each Pair to Have: (AL/GL x ALF) NR

2	Floor Closer	PH27-95SHO-DA	626	RIX
4	Int Pivot	M19	626	RIX
1	Exit Device	35EO	630	VD
1	Exit Device	35NL-OP	630	VD
1	Cylinder	32(W)-0400-7Pin	626	MED
2	Pull	1158 x #4	630	DJM
2	OH Stop	6-Series	630	RIX
1	Threshold	Type 3-427E ¼ -20 SS-MS&LA	719	NGP
2	Alarm Contact	1076D By Security		

Notes: 1) Weatherseal by door mfr.
2) Conduit and wiring by Division 13/16.

HW-7

Restroom
Each Door to Have: (SCPL x HMF) 20Min.

1	Cont Hinge	FM300	630	MAR
1	Latchset	L9010-17A	626	SCH
1	Closer	(P)8501-DA	689	NOR
1	Kick Plate	90 10" x 2" LDW	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-7A

Stair
Each Door to Have: (HMD x HMF) 20Min.

3	Hinge	TA2714	652	McK
1	Latchset	L9010-17A	626	SCH
1	Closer	(P)8501-DA	689	NOR
1	Kick Plate	90 10" x 2" LDW	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-7B

Stair
Each Door to Have: (HMD x HMF) 20Min.

3	Hinge	TA3786	652	McK
1	Latchset	L9010-17A	626	SCH
1	Closer	(P)8501-DA	689	NOR
1	Kick Plate	90 10" x 2" LDW	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-8

Office
Each Door to Have: (SCPL x HMF) 20Min.

4	Hinge	TA2714	652	McK
1	Lockset	L9050P-17A	626	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Closer	(P)8501-DA	689	NOR
1	Kick Plate	90 10" x 2" LDW	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-9

Hallway
Each Door to Have: (SCPL x HMF) — 20Min.

4	Hinge	TA2714	652	McK
1	Lockset	L9060P-17A	626	SCH
2	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Closer	(P)8501-DA	689	NOR
1	Kick Plate	90 10" x 2" LDW	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-9A

Hallway
Each Door to Have: (SCPL x HMF) — 20Min.

4	Hinge	T4A3786	652	McK
1	Lockset	L9060P-17A	626	SCH
2	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Closer	(P)8501-DA	689	NOR
1	Kick Plate	90 10" x 2" LDW	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-10

Electrical, Mechanical, Telephone, Janitor
Each Door to Have: (WD x WDF) — 20Min.90Min

3	Hinge	TA2714	652	McK
1	Lockset	L9080P-17A	626	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Closer	(P)8501	689	NOR
1	Kick Plate	90 10" x 2" LDW @ Janitor	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-10A

Electrical, Mechanical, Telephone, Janitor
Each Door to Have: (HMD x HMF) — NR

3	Hinge	T4A3786	652	McK
1	Lockset	L9080P-17A	626	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Closer	(P)8501	689	NOR
1	Kick Plate	90 10" x 2" LDW @ Janitor	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-11

Control
Each CR Door to Have: (SCPL x HMF) — 90Min.

2	Hinge	TA2714	652	McK
1	Power Transfer Hinge	TA2714-CC	652	McK
1	Lockset	L9080PEU-17A	626	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Closer	(P)8501	689	NOR
1	Kick Plate	90 10" x 2"	630	DJM
1	Wall Stop	1406	630	DJM
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

Notes: 1) Card reader, Alarm Contact Power Supply by Security.
2) Conduit and Wiring by Division 13/16

HW-12

Balcony
Each Door to Have: (AL/GL x ALF) — NR

1	Cont Hinge	FM100	628	MAR
2	Levers	4569	628	ARM
1	Latch	4710	628	ARM
1	Floor Stop	1448	626	DJM
1	Threshold	425	719	NGP
1	Alarm Contact	1076D By Security		

Notes: 1) Weatherseal by door mfr.
2) Conduit and wiring by Division 13/16.

HW-13

Elevator Vestibule
Each MHO Pair Doors to Have: (SCPL x HMF) — 20Min./90Min.

2	Cont Hinge	WT-FM300	630	MAR
1	Auto Bolt Set	940 x BFB	626	DCI
1	Coordinator	600 Series	689	DCI
1	Latchset	L9010-17A	626	SCH
2	Closer	P8501	689	NOR
2	Magnetic Holder	998	689	RIX
1	Astragal	139SS x 5050	630	NGP
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

Notes: Some detector, conduit and wiring by Division 13/16.

HW-14

Elevator Vestibule
Each Pair Doors to Have: (SCPL x HMF) — 20Min./90Min.

2	Cont Hinge	FM300	630	MAR
1	Auto Bolt Set	940 x BFB	626	DCI
1	Coordinator	600 Series	689	DCI
1	Latchset	L9010-17A	626	SCH
2	Closer	P8501	689	NOR
2	Wall Stop	1406	630	DJM
1	Astragal	139SS x 5050	630	NGP
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

HW-15

Entrance
Each Pair Doors to Have: (SCPL x HMF) 20Min./90Min.

2	Cont Hinge	(2)HT-FM300	630	MAR
1	Auto Bolt Set	940 x BFB	626	DCI
1	Coordinator	600 Series	689	DCI
1	Lockset	L9060-17A	626	SCH
2	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
2	Closer	P8501	689	NOR
2	Wall Stop	1406	630	DJM
1	Astragal	139SS x 5050	630	NGP
1	Threshold	413 ¼ -20 SS-MS&LA @60/90MIN	710	NGP
1	Set Seals	5050 HEAD & JAMBS	BR	NGP

Notes: 1) Re-use existing flush bolts.
2) Patch existing door and frame holes and refinish as needed.

HW-16

Trash Enclosure
Each Pair Doors to Have: (HMD x HMF) NR

8	Hinge	T4A3786	630	McK
1	Lockset	L460	626	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
2	Pull	36	630	DJM
2	Cane Bolt	0524.00023	602	RW

HW-16A

Trash Enclosure
Each Door to Have: (HMD x HMF) NR

4	Hinge	T4A3786	630	McK
1	Lockset	L460	626	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
1	Pull	36	630	DJM
1	Cane Bolt	0524.00023	602	RW

HW-17

Trash Enclosure
Each Pair Doors to Have: (HMD x HMF) NR

8	Hinge	I-8508	630	BRO
1	Lockset	L460	626	SCH
1	Cylinder	32(W)-0200-7Pin-CTZ34	626	MED
2	Pull	36	630	DJM
2	Cane Bolt	0524.00023	602	RW

HW-18

Guestroom Entry (T27)
Each Door to Have: (WD x HMF) 90-Min.

3	Spring Hinges	1502 4-1/2 x 4-1/2	651	MCK
1	Hotel Lock	ENTRANCE BY SECTION 08720	625	TIM
1	Cylinder	MORTISE	625	SAR
1	Floor Stop	1211	625	TRM
1	Door Viewer	976U	625	TRM
1	Door Guard	4016 x 4016ED (x 4016S AS REQ'D)	625	TRM
1	Door Bottom	112N	628	NGP
1	Set Seals	5050W HEAD & JAMBS	WHT	NGP

Notes: Stone threshold by others.

END OF SECTION

SECTION 08800

GLAZING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide all glass, glazing, and glazing accessories as indicated, specified, and required, complete.

A. Related Work: Window walls, windows, and entrance doors.

1.02 REFERENCES:

A. American National Standards Institute (ANSI):

Z97.1-84(R94) Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

B. American Society for Testing and Materials (ASTM):

C1036-01 Flat Glass.
C1048-97b Heat-Treated Flat Glass -- Kind HS, Kind FT Coated and Uncoated Glass.

C. Consumer Product Safety Commission:

16 CFR 1201 Safety Standard for Architectural Glazing Materials.

D. Glass Association of North America (GANA):

Glazing Manual.

1.03 SYSTEM DESCRIPTIONS: Glass usage shall be as follows:

A. Lobby windows and entrance doors shall be 1/2" thick or heavier as required to avoid flexing of glass by door operation and other pressure changes. .
B. All other Ground Floor glass shall be clear 1/4" thick glass, tempered where noted or required by Code.
C. All other exterior glass shall be 1/4" lightly tinted blue-green glass, tempered where required by Code.
D. Spandrel glass shall be 1/4" lightly tinted blue-green to match adjacent windows.

1.04 SUBMITTALS: Refer to Section 01330 for procedures.

A. Samples and Product Data: Obtain color instructions from the Architect prior to submission. Submit the following:

1. Samples of various glasses to extent requested by Architect, 9" square with smooth edges.
2. Each glass manufacturer's detailed recommendations and instructions for preparation of glazed openings and installation of glass. With the instructions, submit glass manufacturer's written recommendations for setting blocks and shims, jamb blocks and shims, wedge glazing gaskets, and fixed glazing gaskets to be used for installation of the manufacturer's glasses; include type and placement for each item.
3. Glazing channels or gaskets, 12" long.
4. Manufacturer's technical data for glazing gaskets, weathering gaskets, tapes, separators, setting and side blocks, and other glass setting material showing conformance with requirements specified, including warranties, coordinated with glass manufacturer's recommendations and instructions.

5. Samples of cured glazing sealants in designated colors, with technical Product Data.
6. Unframed wall mirrors, 12" square with manufacturer's data for mirror, primer and adhesive, and warranty.

B. Full-Size Samples: Install full-size Samples of glasses specified below, Samples installed in the frames forming a part of the Work, locations designated by the Architect. Glass showing defects, including excessive distortion, which detract from artistic effect, appearance, and design concept of the building, in the Architect's opinion, shall be removed and acceptable glass installed at no extra cost to the Owner. Approved Sample installations establish the standard of quality required for glass installations of the same kinds and types. Refer to Conditions of the Contract. Full-size Samples are required for:

1. Each type of tempered glass.
2. Tinted plate glass.
3. Spandrel glass.

C. Certificates: Submit from manufacturer stating the quality, thickness, and type of all unlabeled glass delivered to the site for field cutting.

1.04 QUALITY ASSURANCE:

A. Quality Standards: In addition to Code, glass installations shall comply with ANSI Z97.1, as applicable, and Federal Safety Standard 16 CFR 1201.

B. Glass Manufacturers' Usage Recommendations: Furnish each manufacturer's written analysis of glass usage for the exterior glass installations regarding adverse shading conditions and other problems that may occur as a result of the building geometry and glass exposures, with recommended solutions. If no such problems are anticipated by a glass manufacturer, the pertinent written analysis shall so state.

C. Safety Glazing: Provide safety glazing at all openings subject to human impact per Chapter 24 of UBC, 1994.

1.05 PROJECT/SITE CONDITIONS: Protect all glazing until completion and final acceptance of the entire Work. Repair or replace damaged or defective glazing to the original specified condition, at no extra cost to the Owner. Damaged or defective glazing includes glass that cannot be properly cleaned.

1.05 WARRANTY: Refer to Section 01790. Warranty exterior glass installations against loosening, air or water leakage, glass pop-outs, deterioration, and all other defects for 5 years.

A. Glazing Channels and Gaskets: Warranty for 5 years against all defective material or deterioration including, without limitation, shrinkage causing loss of seal and physical failure due to exposure to sun, ozone, elements, smog and other air pollution, and commercial glass cleaners.

B. Unframed Wall Mirrors: Warranty against silver spoilage for 10 years.

PART 2 - PRODUCTS

2.01 GLASS MATERIALS: Glass of domestic manufacture, conforming to ASTM C1036 and ASTM C1048, except total distortion tolerances of ASTM C1048 do not govern over requirements in this Section, and to ANSI Z97.1, by PPG Industries, Inc., Libby-Owens-Ford, Ford Glass, or equal. Label all factory cut panes and do not remove labels until directed. Do not cut unlabeled glass delivered to site as material for field cutting until glass is approved by Architect.

A. Plate Glass: Clear Type I, Class 1, quality q3 float, 1/4" thick unless otherwise indicated or specified, heat strengthened unless tempered glass is indicated or required.

B. Tinted Plate Glass: Manufacture and tint as noted on the Drawings, Type I, Class 1, quality q3 float, 1/4" thick unless otherwise shown, specified, or required to meet structural criteria.

C. Tempered Glass: Furnish factory fully tempered glass. Perform tempering by horizontal roller gas hearth process only; processes making gripper or tong marks are not acceptable. Handle and size glass according to manufacturer's instructions. On each sheet, include an inconspicuous but visible label fused to glass and placed in a lower corner, identifying the tempered glass. Provide fireman's tempered glass label where indicated or as required by the local Fire Department. Furnish clear or tinted plate glass as indicated or required.

D. Spandrel Glass: Heat strengthened except fully tempered where indicated or required by Code or Quality Standards, 1/4" thick, matching color of tinted plate glass.

E. Specialty Glasses: Provide frosted, patterned glasses, and other specialty glass of the types and manufacture noted on the Drawings.

F. Wall Mirrors: Mirror quality float glass, 1/4" thick, edges finished and polished, double silvered with electro-deposited copper coating plus an organic protective coating.

G. Intent: Tempered glasses are an important part of the artistic effect of the building design, and shall conform to the standard of quality established by the approved full-size Sample installations.

2.02 GLASS SETTING MATERIALS:

A Glazing Channels and Gaskets: Extruded neoprene conforming to AAMA SG-1, meeting 5 year warranty requirements, approved colors, sponge units of 40 +/- 5 Durometer Shore A, designed for 20% to 35% compression; dense units of 70 +/- 5 Durometer Shore A for hollow profiles and 60 +/- 5 for solid profiles. Vulcanize gasket corners, both sponge and dense. Provide units designed to produce glass edge pressure of 4 pounds minimum and 10 pounds maximum per linear inch.

B. Blocks and Spacers: Setting blocks of solid neoprene or silicone rubber having 85 +/- 5 Durometer Shore A, block length equal to 0.1" per square foot of glass area but minimum 4" length with length increased as required to eliminate point loading, width not less than width of glazing pocket less 1/8", profiled and secured not to slip during installation and not to obstruct proper drainage of glazing cavity. Provide shims of same material, hardness, width, and length as setting blocks. Provide neoprene or silicone rubber side blocks of 55 +/- 5 Durometer Shore A.

C. Glazing Sealants: For use at glazing perimeters, acceptable sealants are GE Silglaze 2400, GE Silpruf, GE 1200 Silicone, and Dow Corning 795 or 995. For other joints select appropriate sealant for joint size, movement, and substrate; acceptable sealants include GE 1200 Silicone or Silpruf, or Dow Corning 795 and 995, or, where approved, 790. Polybutylene, oleoresinous, asphalt, and oil base sealants are not allowed for any use. Provide sealants of approved colors.

D. Mirror Setting Materials: Palmer Products Corp. "Mirro-Mastic" adhesive, "Mirro-Mastic Bond" primer, and "Mirro-Bac" backing paint.

PART 3 - EXECUTION

3.01 GLAZING: Employ skilled and experienced glaziers. Set glass airtight and true with glazing channels or gaskets according to the GANA "Glazing Manual", glass manufacturer's instructions, and as required herein to obtain weatherproof and waterproof installations. Conform glass edge clearances, and face and edge laps (bite), to Code and requirements herein. Set glass in rabbets with glazing blocks and spacers so glass does not contact frame and to preclude looseness and rattling. Use glass with straight smooth-finished edges free of cracks, chips, swiping, seaming, stress foci, or any other defects on surfaces or edges for all glass installations.

A. Setting Blocks: Unless otherwise recommended by glass manufacturer or in the GANA "Glazing Manual" for type of glass installation, provide setting blocks of the correct size located at the bottom quarter points of each glass pane, and side blocks in both jambs in upper half of panes retained by metal caps.

B. Glazing Gaskets and Channels: Compress at least 15% by stops and at least 5% lengthwise to prevent corner pullout, but do not exceed allowable compressive forces on the glass. Interior gaskets shall have molded corners.

C. Glazing Sealant: Ensure sealant installations form a continuous airtight and watertight seal for entire perimeter of each glass pane. For glass secured by metal frames or stops on two or more edges, hold glazing gaskets or channels back at least 1/8" from the sight lines and fill the voids with glazing sealant finished flush with stops, sealant installed on interior side of glass.

D. Mirrors: Clean backings, apply primer, and allow to dry. Verify organic coating on the backs of mirrors is compatible with the adhesive; if not, apply the mirror adhesive manufacturer's recommended backing paint and allow to dry. Conform to the adhesive manufacturer's instructions and apply adhesive in spots that, when compressed, will cover not less than 60% of the mirror area. Allow 3/16" space between mirror back and substrate. If mirror is cut from a larger mirror sheet, apply backing paint on cut backing edge. Brace installed mirrors in place until adhesive is fully set.

3.02 COMPLETION: Conform to Section 01740. Do not use any harsh or abrasive cleaning agents, caustics, or acids for cleaning. Wash and polish vision glass both sides and leave glass free of soiling, streaks and labels. Wash and polish mirrors.

END OF SECTION

SECTION 09100

METAL SUPPORT ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide non-load-bearing metal support systems, complete.

A. Work Included:

1. Metal framing for gypsum wallboard walls and ceilings.
2. Metal framing for portland cement boards.
3. Metal backing plates for securing materials of other trades.
4. Installation of access panels on metal framing as furnished by other trades and under Work of Section 08310.
5. Metal supports for stone countertops at lavatories, with integral legs.
6. Install access panels indicated on Architectural Drawings.

B. Related Work:

1. Gypsum wallboard and portland cement boards..
2. Hanger wires and framing for suspended grid acoustical ceilings.
3. Thermal and sound insulation.
4. Furnishing access panels for the mechanical, electrical, and other trades and not shown on the Architectural Drawings.
5. Load bearing metal stud systems specified in Division 5.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit for all materials in this Section.

B. Shop Drawings: Submit showing layouts and details including stud size and anchorage for every wall, partition, ceiling, and shaft system constructed under the Work of this Section. Include detailed material and installation requirements for steel stud framing for interior walls to receive gypsum wallboard and adhesive applied stone veneer, coordinated with the calculations specified below.

C. Samples: Submit such Samples the Architect may request.

D. Calculations: Submit calculations prepared and signed by a qualified licensed engineer to show that the steel stud framing for interior walls to receive gypsum wallboard and adhesive applied stone veneer, as shown in the submitted Shop Drawings, meets the L/480 deflection limitation for these walls as specified herein.

1.03 QUALITY ASSURANCE:

A. Code: Conform all installations to Code. If conflict occurs between Contract Documents and Code, the more stringent requirements shall govern.

B. Tolerances: Erect walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10-foot straightedge for its entire length at any location within a 1/8" tolerance. Erect horizontal plane framing level within a tolerance of 1/8" in 12-feet in any direction. Erect sloped framing in true planes to same tolerance as horizontal plane framing.

C. Deflection Limitation: In addition to meeting Code requirements, the interior walls to receive gypsum wallboard and adhesive applied stone veneer, under design loading normal to the completed walls required by

Code and seismic loads, the deflection limitation for these walls is L/480. Required wall stiffness shall be obtained by increasing stud gage and/or decreasing stud spacing, and/or by inclusion of additional structural steel type framing members, all at no extra cost to the Owner. In no case shall the thickness of involved walls or partitions be increased to meet this deflection limitation requirement.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Screw-On Drywall Studs: ASTM C645 and following requirements:

1. Standard Drywall Studs: Electrogalvanized steel with punched utility openings and knurled flanges at least 1-1/4" wide, with flange returns. Furnish 20 gage studs except where 18 gage or heavier is indicated, specified, or required.

2. Stud Height: Gages specified above are minimum. Where required stud height exceeds Code approvals, provide heavier gage studs and/or decrease stud spacing as necessary to conform to Code approvals, at no extra cost to Owner.

3. Stud Accessories: Provide standard related accessories including top and bottom tracks, clips, fasteners, and like items, of same manufacture as each type of stud specified, as required for complete installations.

B. Furring and Runner Channels: Hot-rolled or cold-rolled steel, coated with rust-inhibitive paint, weight per 1,000 lineal feet before coating not less than:

Size	Hot-Rolled	Cold-Rolled
3/4"	300 lbs.	300 lbs.
1-1/2"	1120 lbs.	475 lbs.
2"	1260 lbs.	590 lbs.

C. Screw-On Drywall Furring Channels: ASTM C645, minimum 0.022" thick zinc coated steel, minimum 1-3/4" face, 2-3/4" base span, and 7/8" furring depth.

D. Wires: Soft-annealed galvanized steel wire, of gage specified for hanger wires and 16 gage for framing unless otherwise specified.

E. Metal Primer: Red oxide type conforming to all AQMD requirements.

F. Steel Backing Plates: Minimum 4" wide by 16 gage steel unless otherwise indicated. Apply shop coat of metal primer.

PART 3 - EXECUTION

3.01 INSTALLATION OF STUD TRACKS: Bolt or screw fasten to metal and anchor at least 1-1/4" into concrete with bolts and expansion shields, sleeved 'dryvins', cinch anchors, screws and lead plug, powder-driven fasteners, drilled and bolted steel shells, or other approved device. Maintain a minimum 3" clearance between fasteners and edge of concrete. Concrete nails are not acceptable. Secure all tracks within 6" of ends and maximum 24" centers between unless otherwise shown or a lesser spacing is required by Research Report approval for the framing system installed. At drywall jamb studs of door openings, cut flanges of bottom track and turn track at least 8" up on jamb studs; screw fasten the turn-ups to jamb studs through both flanges near top and bottom of turned-up track.

3.02 WALL FRAMING AND FURRING FOR DRYWALL TYPE FINISH:

A. Screw-On Drywall Type Studs: Provide studs spaced as shown. Cut studs 1/2" short and secure to top track in manner that allows deflection of structure above. Provide full height doubled studs at all jambs of openings, with studs mechanically connected or welded together to form a rigid column. Form the head and sill of openings with track sections screwed or bolted to jamb studs unless otherwise shown. Install 16 gage studs for wall-hung lavatories, urinals, grab bars, wall-hung equipment, and elsewhere shown. Conform to approved Shop Drawings for walls to receive gypsum wallboard and adhesive applied stone veneer.

B. Slip-Type Top Track Assembly: Provide upper slip track of minimum 14 gage zinc coated steel unless otherwise shown, sized to securely hold wall top track yet allowing at least 1/2" vertical movement at connection. Secure upper track to structure above at 24" centers maximum. Screw fasten wall top track to each wall stud with screws placed below the slip joint movement area.

C. Walls Over 6" Wide and Chase Walls: Where partitions are indicated with a stud web dimension over 6", and at chase walls, install two stud rows and cross brace with gypsum wallboard braces, 2-1/2" steel stud braces, or steel stud and runner braces as illustrated in current USG "Gypsum Construction Handbook" and as covered by the pertaining Code approval. Construct fire-rated chase walls in strict conformance with Code approval for the system installed.

D. Wall Bridging: Provide 3/4" channel bridging or the stud manufacturer's standard bridging at maximum 60" vertical centers in walls and partitions. At heads of all doors, and heads and sills of wall openings, provide 1-1/2" runner channel bridging extending to the second stud beyond each side of jambs and wire tied to each stud. Where studs receive drywall finish on one side only, provide horizontal galvanized steel strap bridging at 48" centers vertically, secured to each stud with screws, bolts, or welding; in addition, for each 20-feet of wall run, provide horizontal diagonal X-bracing consisting of the same straps with one end secured to the unsupported stud flange and other end secured to flange that receive finish of adjoining stud, diagonal X-bracing installed at the same interval as the horizontal strap bridging.

E. Wall Furring: Install metal stud or channel furring as indicated.

F. Welding Repair: Wire brush, scrape, and remove burned or damaged factory finish. Coat all welds and bare metal with metal primer.

3.03 SUSPENDED CEILINGS AND FURRING: Provide hanger wires secured to structure above according to Code and approved submittal. Allow sufficient length for two or more complete turns or saddle turns around the runner channels at proper ceiling height.

A. Suspended Drywall Finish Framing: Provide 8 gage hanger wires at maximum 48" centers, 1-1/2" runner channels spaced at maximum 36" centers, and screw-on drywall furring channels spaced at maximum 16" centers; secure furring channels to the runner channels with Code approved galvanized steel clips or wire ties.

B. Connections: Turn twice or saddle tie hanger wires around runner channels and twist three times around standing wire. Adjust hanger wire to bring furring and ceiling to level and true plane. Lap runner channels 12" minimum at splices and tie with a double wrap of 16 gage wire 2" from each end of splices. Saddle tie furring channels to each runner channel with at least two strands of 16 gage tie wire. Lap furring channels 8" minimum at splices and tie with a double wrap of 16 gage tie wire 1" from each end of splices.

C. Suspension Under Ducts: Where the runs of hanger wires are spaced at 4 to 5-1/2 feet apart to clear ducts, provide minimum 6 gage hanger wires spaced at maximum 36" centers parallel to duct run with minimum 2" runner channels spaced at maximum 36" centers and spanning under ducts, and screw-on drywall furring channels spaced at maximum 16" centers. For greater spans, design metal framing system for a live load of 10 pounds per square foot of area plus dead load and fully detail in Shop Drawings.

D. Furring: Provide framing for horizontal furring as required, and conform to above requirements as applicable.

E. Compression Struts: Provide as shown and as required by Code.

3.04 BACKING PLATES AND ANCHORAGE: Provide backing plates and attach to metal studs or furring for anchoring various items indicated or specified under other Sections. Comply with the approved submittals specified under other Sections as applicable to steel backing plates. Backing plates may be omitted if anchorage for wall-hung items is directly into steel studs of 18 gage or heavier, or items are furnished with equal mounting devices. Install backing plates of lengths to span over at least two supports, equipped with two countersunk machine screws at each stud or support except plates may be welded to 18 gage or heavier studs and supports. Wall-mounted and wall-hung items that require backing plates include, without limitation, the following:

A. Wall railing
B. Grab bars.
C. Toilet compartments and urinal screens.
D. Toilet room accessories.
E. Base cabinets.
F. Plumbing fixtures.
G. Steel ladders.
I. Wall mounted door stops.

3.05 ACCESS PANELS: Install and rigidly connect to metal framing. Coordinate the exact required locations with related trades. On acoustical unit ceilings, install the panels to align with and maintain the grid pattern. Check all other Sections of Specifications for access panels specified to avoid duplication.

3.06 CONNECTIONS TO STEEL DECKING: Install as shown and required by Code; use UL listed and labeled incombustible fibrous glass safing insulation to pack void spaces.

END OF SECTION

SECTION 09220

PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide portland cement plaster, complete.

A. Work Included:

1. Metal lath and plaster accessories.
2. Portland cement plaster.
3. Gypsum sheathing under exterior plaster and elsewhere as indicated.

B. Related Work:

1. Studding, furring, and support framing for plaster.
2. Finish painting.

1.02 REFERENCES:

A. American Society for Testing and Materials (ASTM):

A653-01 ..... Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
C79-01 ..... Gypsum Sheathing Board.
C91-01 ..... Masonry Cement.
C150-02 ..... Portland Cement.
C206-84(97) ..... Finishing Hydrated Lime.
C631-95a(2000) .. Bonding Compounds for Interior Gypsum Plastering.
C847-95(2000).... Metal Lath.
C897-00 ..... Aggregate for Job-Mixed Portland Cement-Based Plaster.
C926-98 ..... Application of Portland Cement-Based Plaster.
C932-98a..... Surface-Applied Bonding Agents for Exterior Plastering.
C1063-99..... Installation of Lathing and Furring for Portland Cement-Based Plaster.
E84-01..... Surface Burning Characteristics of Building Materials.
E136-99..... Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

B. Federal Specification (Fed Spec):

UU-B-790A ..... Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent, and (Int 1) Fire Resistant).

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit showing layout of all expansion, contraction, control, and seismic drift joints. Show all accessories intended for use, all splices, interfaces with all components of the wall, including lapping with moisture barrier, etc., required to produce a sound wall free of shrinkage cracks, and compatible with adjacent Work including mechanisms, flashings, and joints necessary to accommodate seismic motion.

B. Preliminary Samples: Submit the following:

1. Exterior plaster texture and finish, 24" square, prepared at site for each color and finish texture.
2. Each type and size of plaster trim and accessory.

C. Final Wall Samples:

1. Exterior Plaster: Based on the approved Preliminary Samples, prepare one full unit of each exterior plaster system and finish between expansion screeds with Sample at least 8-feet square, for final approval; remove rejected Samples and repeat the Sample procedure until final approval. The approved Final Samples shall remain in place if meeting all other requirements and is so approved.

D. Manufacturer's Instructions: Submit manufacturer's detailed installation instructions for the optional DuPont "Tyvek Weatherization System" based on Tyvek "Commercial Wrap System". Include the manufacturer's details for connecting the plastic wrap to openings, penetrations, and terminating framing to ensure continuous and correct air and water barrier installations.

1.04 QUALITY ASSURANCE:

A. Requirements of Regulatory Agencies: Conform all Work of this Section to Building Code except as exceeded herein. In event of conflict between any code, law, ordinance, and requirements herein, comply with better or most restrictive requirements. Install and maintain scaffolds, staging, trestles, and planking in conformance with Title 8 CCR and applicable laws and ordinances.

B. Tolerances: Produce completed plaster surfaces not deviating from plumb, straight, and plane more than 1/8" in 12-feet at any location and any direction when tested with a straightedge or stringline. Tolerance deviations may not accumulate. In addition, produce finished surfaces free of abrupt offsets, waviness, or unsightly conditions when viewed in any lighting condition, as determined by the Architect, even though the area or surface may be within the measured tolerance.

C. Manufacturer's Site Instruction: If installing workers are not experienced in installation of the Tyvek plastic wrap material, arrange for a Tyvek Weatherization Specialist representative of the manufacturer to instruct the installing crews at the site in correct procedures. Contact Huttig Building Products, Mira Loma, Calif, 909/361-0100, Mr. Jim Hamm.

PART 2 - PRODUCTS

2.01 LATH AND ACCESSORY MATERIALS: Each bundle of lath shall be sealed with a metal tag bearing the lath designation, weight, and manufacturer's name.

A. Expanded Metal Lath: Conforming to ASTM C847 and requirements herein, all small diamond mesh expanded metal lath weighing 3.4 psy and having zinc-coating conforming to ASTM A653, coating G60 or better; for exterior surfaces other than horizontal soffits, same expanded metal lath with a factory-applied waterproofed paper backing having flame spread of 25 or less per ASTM E84 test and bearing UL label, conforming to Fed Spec UU-B-790a (Int-1), Type III, Grade F, Style 10 and Code, by USG/Unimast, Inryco, Western Metal Lath, California Expanded Metals, or equal. On solid backings, furnish same lath but of the self-furring type.

B. Waterproofed Paper: Double-ply reinforced laminated paper, flame spread of 25 or less per ASTM E84 test and conforming to Fed Spec UU-B-790a (Int-1), Type III, Grade F, Style 10.

C. Optional Plastic Building Wrap: In lieu of the factory paper-backed metal lath specified above, provide same metal lath without the paper backing and provide DuPont Tyvek Commercial Wrap bearing ICBO Report No. 4000 approval, complete with manufacturer's recommended DuPont Contractor Tape for sealing laps and wall openings and penetrations, and self-drilling screws with washers for securing the Tyvek wrap over gypsum sheathing and into wall studs.

D. Corner and Strip Reinforcing Lath: Flat or shaped lath reinforcing units, galvanized expanded metal lath or galvanized wire lath types weighing not less than 2.5 psy, with outstanding legs of 2" for wire lath and 3" for metal lath if formed for angle reinforcing.

E. Plastering Accessories: All of zinc alloy for exterior plastering, with expanded wings, matching the approved Samples. Interior accessories may be of minimum 26 gage galvanized steel. Include casing beads, expansion screeds, and all other items as indicated, specified, or required.

1. Exterior Expansion Screeds: Similar to Keene #40 or Superior J-4-U adjustable 2-piece type, sizes and profiles indicated or directed and approved; include Keene #7 Spacer Arrangement where required by joint width.

2. Drip Screed, Track, or Mold: Superior #10 or #27 as required by the installation condition or detailed.

3. Control Screeds: Similar to USG #50, #75, and #100, as required by details or installation conditions.

4. Casing Beads: Superior or USG, similar to USG #66 by height required for plaster thickness.

5. Exterior Corner Reinforcement: Use Western Metal Lath "Stucco-Lok" or Stockton Wire Products "Corner-Aid".

6. Weep Screeds: Size and type as shown, conforming to Code.

7. Aluminum Accessories: By Fry Reglet, factory treated for painting. Provide aluminum reveals as indicated, with clear anodized finish.

F. Screws: Self-drilling self-tapping zinc or cadmium coated type with large head or fitted with zinc coated washers to engage the lath.

G. Gypsum Sheathing: Standard product sheathing, ASTM C79, by Domtar, Georgia Pacific (Dens-Glas Gold), Gold Bond, or USG, gypsum core, both face sides and long edges covered with bonded water repellent paper, 1/2" thick unless otherwise indicated. Where indicated or required by Code, furnish 5/8" thick gypsum sheathing or 5/8" thick Type X gypsum sheathing.

H. Flashing for Exterior Openings and Self-Adhesive Waterproofing: For flashing around windows and similar openings in exterior walls, and for waterproofing as specified herein, and moisture protection at horizontal surfaces extending at least 9" on each adjacent surface, both up and down, W.R. Grace & Co. "Ice and Water Shield" or 40-mil "Jiffy Seal Ice and Water Guard" by Protecto-Wrap Company, Denver, Colorado, 303/777-3001.

I. Waterproof Sheeting: Use one of the following as specified.

1. Neoprene Sheeting: Standard product uncured neoprene sheeting, minimum 30 mil thickness, with manufacturer's recommended adhesive for laps and splicing.

2. PVC Sheeting: Standard product PVC sheeting, minimum 10 mil thickness, with manufacturer's recommended adhesive for laps and splicing.

2.02 PLASTER MATERIALS:

A. Exterior Stucco: Furnish stucco conforming to the general requirements of "Specifications and Standards for Manufactured Stucco Finishes" published by the Stucco Manufacturers Association and manufactured by California Stucco, Highland Stucco, LaHabra, or equal, delivered in manufacturer's sealed factory containers and requiring only addition of water for use, with sand consisting of a blend of No. 20 to No. 30 for smooth or sand float finish, and blend of No. 16 to No. 20 for heavier texture finishes; mix and sand gradations shall be suitable for the finishes specified. Furnish factory integrally-colored stucco except as otherwise specified. Stucco materials shall be suitable for a smooth hard trowel finish.

B. Portland Cement: ASTM C150, Type II, low alkali. Plastic portland cement may be used in accordance with UBC Chapter 25.

C. Hydrated Lime: ASTM C206, Type S.

D. Sand: For cement plaster base coats, washed natural sand conforming to ASTM C897 including gradation, clean and with SE of 85 or better.

E. Water: Clean, potable and from domestic source.

F. Waterproofing Admix: Sika Suconem Red Label or Anti-Hydro.

G. Base Coat Reinforcement: Alkali-resistant fibrous glass shorts or polymer plastic shorts expressly manufactured and in current use as a plaster base coat reinforcement.

H. Plaster Bonding Agent: ASTM C932, as recommended by manufacturer for each specific use.

2.03 PLASTER PROPORTIONS: Plaster proportions are by volume unless otherwise specified. Use calibrated measuring boxes for proportioning. Use of "shovel measure" is not acceptable. Proportion exterior portland cement plaster according to UBC Table 25-F for portland cement plaster or portland cement-lime plaster. Exterior plaster base coats shall contain at least one pound of base coat reinforcement material per 94 pounds of portland cement, and waterproofing admix in proportion recommended by manufacturer.

2.04 PLASTER MIXING: Machine mix all plaster in the proportions specified with only sufficient water to attain the proper consistency for application. Clean mixers and tools and keep free of hardened plaster materials. If plaster base coats are machine applied, take samples of plaster from nozzle of the plastering machine hose and perform slump tests using a 2" by 4" by 6" cone; mix plaster to maximum slump of 2-1/2" for portland cement plaster.

PART 3 - EXECUTION

3.01 LATH INSTALLATION: Conform lath installation to ASTM C1063 as applicable, except as exceeded by Code or requirements herein.

A. Lath Usage: Use expanded metal lath for exterior horizontal plaster. Use expanded metal lath with paper backing for vertical or sloping exterior plaster, self-furring lath type where installed over solid backing or sheathing. Omit paper backing if optional plastic building wrap is used.

B. Expanded Metal Lath: Apply with long dimension across bearings, end laps offset at least one support, joints lapped 1/2" on sides and 1" on ends. Break lath continuity at expansion and control screeds and unrestrained angles. Tie laps with 18-gage wire midway between supports at side laps and 6" intervals on end laps. Secure the lath to all supports at 6" centers.

C. Expanded Metal Lath With Paper Backing: Install lath, lap paper backings, handle, and screw fasten in conformance with manufacturer's printed instructions and the Building Code approvals. Install waterproofed paper backings "shingle" fashion to ensure positive drainage of penetrated water to exterior. Correctly "shingle" paper with flanges of plaster accessories and metal joints, and do not run the paper backings continuously behind expansion joints, control joints, and similar fittings and flashings. At expansion and control joints and screeds cut the lath, install strips of waterproofed paper where required, overlap joins of paper backings, and wire tie metal lath to expanded wings of joints. Ensure the installation maintains the full waterproofing continuity of flashings, screeds, and paper backings. Omit the paper backing if DuPont Tyvek Commercial Wrap is provided as specified below.

D. Optional Plastic Building Wrap: Apply the Tyvek Commercial Wrap in strict accordance with the manufacturer's instructions, run horizontally with overlapping "shingle" fashion laps to ensure positive drainage

of penetrated water to exterior. Correctly "shingle" plastic wrap with flanges of plaster accessories and metal joints, and do not run the plastic wrap continuously behind expansion joints, control joints, and similar fittings and flashings. At expansion and control joints and screeds cut the lath, install strips of plastic wrap where required, overlap joins of plastic wrap, and wire tie metal lath to expanded wings of joints. Extend plastic wrap into wall openings and around penetrations, produce air and water tight connections to fully seal the openings and penetrations with the specified tape, and seal all laps with tape. Ensure the installation maintains the full waterproofing continuity of flashings, screeds, and backings. Install metal lath as specified above.

E. Ceiling and Soffit Lath: On metal supports, provide an additional 11 gage wire tie at maximum 27" centers along all supports.

F. Gypsum Sheathing: Install with long paper-bound edges horizontal and with end joints staggered and centered on supports. Secure with screws.

G. Self-Adhesive Waterproofing: Apply on gypsum sheathing, and on concrete surfaces at coping areas, at horizontal and sloping exterior plaster surfaces, placed shingle fashion and lapped 2" at splices. Extend waterproofing up behind lath paper backing on surfaces above waterproofing and extend down over lath paper backing on surfaces below the waterproofing, all properly shingled to expel leakage water to the exterior.

3.02 LATHING ACCESSORIES: Set metal accessories plumb, level and true and shim where required. Miter accessories at corners, and accurately and tightly flush fit exposed joints. Install accessories in sections of longest available length with minimum splicing. Fasten to supports at not more than 12" centers.

A. Exterior Corner Reinforcing: Install for full length of external angles of exterior plastering.

B. Casing Beads and Plaster Stops: Install at free edges of plaster, where plaster abuts against other finish material, and elsewhere as shown.

C. Plaster Expansion Joints: Install types as shown and approved, joints and connections coped and shingled to prevent the entry of water. Where directed or necessary, seal connections with sealant conforming to Section 07920 at no extra cost to Owner. Where not indicated, provide expansion joints at maximum 12-foot intervals and as required to divide plaster into maximum 120 square foot areas, located as directed.

D. Weep Screeds: Provide at bottom of exterior plastered walls as required by Code.

3.03 EXTERIOR PORTLAND CEMENT PLASTER APPLICATION: Apply plaster on metal lath to minimum 7/8" total thickness measured from face of supports.

A. Exterior Plaster Type: Apply scratch and brown coat base coat plaster and minimum 1/8" thick stucco finish coat, uniform smooth trowel finish.

B. Application of Base Coats: Apply a fine fog spray of water as soon as the plaster base coats are set enough to prevent injury. Do not let plaster dry out between water applications.

1. Scratch Coat On Lath: Apply scratch coat at least 1/2" thick from the face of supports to crest of scores, forming good key on metal lath. Thoroughly scratch in one direction only and keep at optimum moisture with fog water spray for 48 hours minimum before second coat is applied.

2. Brown Coat: Set temporary wood or metal spot or strip grounds. Bring plaster to true planes between metal screeds. Apply brown coat plaster not less than 3/8" thick; use long rigid darbies controlled by grounds and bring surfaces to a straight, plumb, and true condition about 1/8" back of metal trim edges and flanges. As each area is applied, check surfaces with stringlines or equivalent and, before brown coat sets, correct all low or high areas and excess build-ups at screeds, joints, corners, and angles. After straightening, remove temporary grounds and fill the voids with brown coat plaster. Float the surface to proper texture for the finish coat, keep moist for 72 hours, and allow to air cure for at least 5 days before applying finish coat.

3. Application of Base Coats on Concrete and Masonry: Roughen and clean concrete surfaces, coat with plaster bonding agent, and apply plaster within the open time of the agent; otherwise recoat with the same bonding agent. Clean and then dampen the masonry surfaces to optimum moisture. Set temporary grounds and apply brown coat plaster by the double-back method using heavy pressure for good bond to 1/2" thickness minimum from the face of concrete or masonry as specified above for brown coat plaster, check and straighten surfaces, then damp cure and air cure the same as brown coat plaster on lath.

C. Application of Finish Coat: Recheck brown coat surfaces for straight and true before applying the finish coat and correct defects. Apply finish coat at least 8 days after application of brown coat. Dampen surfaces of brown coat for uniform suction. Lay out the finish coat to permit completion of an entire area between joints and screeds or carry to a natural break point. Work the top and bottom of walls and all other areas within screeds at the same time, without dry laps, producing uniform finish and appearance flush with the screeds and joints, and free of lap and tool marks, low or high spots, crazing, checking, waviness, offsets, or other defects.

1. Smooth Trowel Exterior Finish Coat: Apply a fine sand float finish and then follow with a light steel troweling just sufficient to set the sand without densifying the surface excessively or producing slick spots, trowel marks, or sand tears. Where a "hard trowel" finish is indicated, specified, or directed, follow the preceding troweling with a second steel troweling after the surface sets sufficiently to be densified by the second troweling.

3.04 CURING OF EXTERIOR PORTLAND CEMENT PLASTER: Keep each plaster base coat thoroughly wet to the full coat depth for three days after application with a regulated spray of water. After initial set, prevent surface drying at any time during curing process. Test plaster surfaces by spraying with a water spray bottle; if plaster absorbs spray, increase the application of curing water until test spray is not absorbed by the plaster.

3.05 PLASTER PATCHING: Plaster containing cracks, blemishes, blisters, trowel marks, pits, checks, discolorations, or other defects is not acceptable. Remove defective plaster and replace with conforming plaster as approved. Restore all surfaces damaged, stained, or defaced by plastering as directed and at no extra cost to Owner.

3.06 CLEANING UP: Conform to Section 01740. Remove all plaster droppings and waste or unused materials. Leave surfaces clean and in proper condition for subsequent materials.

END OF SECTION

SECTION 09250

GYPSUM AND PORTLAND CEMENT BOARDS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide gypsum and portland cement boards, complete.

A. Work Included:

1. Gypsum wallboard finish on walls and ceilings.
2. Joint, edge, corner, and fastener finishing.
3. Sound and airsealing Work of this Section.
4. Shaft wall system.
5. Portland cement backer board and vapor barrier for ceramic tile finish in toilet and wet areas.

B. Related Work:

1. Metal support framing.
2. Sound insulation in gypsum wallboard walls and partitions.
3. Thermal batt and safing insulation.
4. Painting.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit covering wallboard installations, including finish accessories, finishing materials, sealing, and wallboard manufacturer's written installation instructions with copies of Code approvals for each wall, ceiling, and shaft system, including the fastener types and spacings. Submit manufacturer's detailed preparation and installation instructions for portland cement backer board.

B. Samples: Submit such Samples the Architect may request.

1.03 PROJECT CONDITIONS: Make detailed inspection of areas and surfaces to be enclosed or covered by gypsum drywall and arrange for correction of defective workmanship or materials. Ascertain that all other Work enclosed by drywall has been inspected and approved before starting installation; otherwise, uncover as directed at no extra cost to Owner.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Gypsum Wallboard: ASTM C36, tapered edges for exposed surfaces, regular grade except use Type X where indicated or required by the Building Code. For walls in toilet rooms and for interior walls to receive thin-set tile or thin-set interior stone veneer, and where indicated, provide Type W/R or Type X W/R water resistant boards as required. For ceilings in toilet rooms and wet areas, provide USG or approved equal "soffit board" complete with manufacturer's water resistant taping and finishing materials.

B. Screws: ASTM C1002, corrosion-resistant self-tapping bugle-head spiral-threaded type, minimum 1" long except 1-5/8" for double layer walls, lengths to penetrate all supporting metal at least 3/8". Furnish specially hardened type screws for supports heavier than 25 gage.

C. Metal Trim and Corner Beads: Electrogalvanized steel with taping flanges, as manufactured or recommended by drywall manufacturer, corner beads at outside corners and "J" or "L" shaped trim members where abutting other materials.

D. Control Joints: USG/Unimast Control Joint #093.

E. Resilient Channels: USG/Unimast RC-1.

F. Finishing Materials: ASTM C475, joint tape, bedding compound, finishing compound, adhesive, and laminating compounds supplied by wallboard manufacturer.

G. Acoustical Calking Compound: Non-hardening polysulphide type or elastic water-base type; Tremco Acoustical Sealant, US Gypsum Acoustical Sealant, or approved equal.

H. Portland Cement Board: USG "Durock Tile Backer Board" or "Wonder-Board", of nominal 1/2" thickness, complete with the tile backer board manufacturer's installation screws and joint reinforcing tape. Provide the tile backer board where scheduled to receive thin-set ceramic tile finish materials, and elsewhere indicated. Where portions of the tile backer boards remain exposed, furnish the cement board manufacturer's recommended water resistant tape, primer, and joint compound for finishing exposed joints and surfaces.

I. Vapor Barrier: ASTM D2103 or NBS Voluntary Product Standard PS 17-69, 8 mil thick polyethylene sheeting with minimum 2" wide waterproof self-adhering plastic tape.

PART 3 - EXECUTION

3.01 INSTALLATION OF GYPSUM WALLBOARD: Perform all wallboard installation and finishing according to ASTM C840 and wallboard manufacturer's instructions. Do not install gypsum board until building is weathertight. Conform to fire-rating requirements, Building Code approvals, and requirements herein.

A. Temperature: Maintain minimum 65 degrees F temperature in the building during the gypsum board installation. Furnish ventilation to eliminate excessive moisture.

B. Fasteners: Install with heads below the surface without breaking surface paper or stripping steel framing member around the fastener. Space according to Code approvals.

C. Openings: Accurately cut and fit the wallboard at openings. At door and other openings, cut wallboard to continue across area above opening head; do not cut wallboard to both jambs and fill in the transom area over such openings with separate pieces. Make dimensions from the joint over head of an opening to jamb of openings 6" minimum. Stagger joints on opposite side of partition.

D. Single Layer Walls:

1. Standard Walls: Place wallboard horizontally with the long dimension across the studs or in one-piece vertical heights, vertical joints centered over supports and staggered on walls so as not to occur on opposite sides of the same stud. Secure to each stud and track with screws keeping screws 3/8" from edges.

2. Sound-Insulated Walls: Place wallboard in one-piece vertical heights only, vertical joints centered over supports and staggered on walls so as not to occur on opposite sides of the same stud. Secure to each stud and track with screws keeping screws 3/8" from edges. Where required wall heights exceed the maximum commercially available wallboard lengths, provide a 26 gage metal tape spanning between the framing members to close the back of the horizontal joints, tape bonded in place with laminating adhesive or equal. Horizontal joints are not allowed in other locations.

E. Multi-Layer Walls:

1. Standard Walls: Apply first layer same as for single layer standard walls, all vertical joints in subsequent layers staggered with respect to first layer. Do not use laminating adhesive.

2. Sound-Insulated Walls: Apply the first layer vertically, same as for single layer sound-insulated walls except metal tape is not required, subsequent layers installed with the long dimension vertical and joints staggered one stud space with respect to the preceding layer, all vertical joints centered over the studs. If horizontal joints are required by wall height, offset the horizontal joints at least 16" between the wallboard layers. Finish tape the outer layer joints only. Do not use laminating adhesive.

F. Wall Recesses: Continue gypsum board layers behind fire extinguisher and fire hose cabinets, toilet accessories, and other equipment and finish items as indicated and as required to maintain wall fire resistance ratings indicated or required by Code.

G. Suspended Ceilings: Set wallboard with the long dimension across furring channels, end joints staggered and centered on furring channels. Use wallboards of maximum practical length to minimize end joints and properly support around cutouts and openings. Secure with screws.

H. Control Joints: Provide in straight walls where runs exceed 30-feet and in ceilings where runs exceed 40-feet, with locations as approved.

I. Resilient Channels: Install across supports, with end splices centered on supports. Screw fasten to each support using minimum 1-1/4" long screws.

3.02 JOINT TREATMENT AND FINISHING: Apply tape bedding compound, tape, and at least three coats of finishing cement on all exposed joints, and other joints as required for sound insulated or fire-rated walls. Apply joint cement and two or more layers of finishing cement over screw heads. Treat all inside corners with joint cement, tape, and finishing cement. Cover outside corners and angles with corner beads and finishing cement. Provide casing bead at wallboard edges which abut ceiling, wall, or column finish, and elsewhere as shown or required such as openings, offsets, etc. Produce non-apparent joints, trims, and fasteners after application of paint or other finishes; correct defects as directed at no extra cost to Owner. Seal the raw edges of plumbing openings and of boards that have been cut to fit with manufacturer's recommended sealant brushed on. Sanding of taped joints and fastener heads on wallboard concealed in above-ceiling or attic spaces is not required. When the entire installation is completed and prior to installation of finish materials by other trades, correct and repair all broken, dented, scratched, or damaged wallboard.

3.03 AIR SEALING: Seal the connections between shaft walls, ducts, plenums and building structure airtight with specified calking compound or tape and cement, including vertical shafts.

3.04 CALKING: At sound insulated partitions, calk between wallboard edges and floors, walls, and at structure above other than acoustical ceilings with above acoustical calking compound, forming a complete perimeter seal; calk both layers at multi-layer walls. Calk around outlet boxes and other penetrations in same manner.

3.05 SKIM COAT FINISH: Apply a troweled skim coat of topping compound after joint and fastener finishing is completed, laid on to a uniform thickness of at least 1/16" and troweled smooth and free of trowel marks. When dry, sand where required to remove any trowel marks or other defects and produce smooth uniform surfaces free of sanding or fastener depressions. Skim coat finish is required for gypsum board surfaces in corridors and lobbies, and in other areas wherever gypsum board is to receive an enamel finish.

3.06 SHAFT WALL SYSTEM: Provide special type steel stud, gypsum wallboard, and sound insulation wall system designed for installation from the room or corridor side, UL listed and Code approved 2-hour fire resistance rating and a tested STC of 50 or better, by USG, Flintkote, or equal. Conform the installation to Code and UL approvals and seal airtight.

3.07 PORTLAND CEMENT BACKER BOARD: Provide at ceramic tiled wall surfaces and where indicated as backing for exterior stone veneer. At ceramic tiled wall surfaces and where indicated, install plastic vapor barrier over framing in single sheet or installed shingle fashion, lapped 6"; all laps, joins, and penetrations sealed with tape. Screw fasten board to metal studs and seal all joints according to the manufacturer's instructions.

Install boards with the smooth surface against framing where board receives thin-set tile, and with the textured side against framing where backer board remains exposed. Fit the backer board edges and ends closely but do not force together. Center edge or end joints on framing members and stagger joints in adjacent rows.

A. Thin-Set Tile Covered Surfaces: Fill joints and reinforcing tape with the same latex-portland cement mortar to be used for the thin-set tile. At showers, shower pans, shower receptors, and similar fixtures, place temporary 1/4" spacer strips around lip of the fixtures and install backer board abutting top of the spacer strip; remove spacer strips after boards are secured in place.

B. Exposed Backer Board Surfaces: Seal exposed backer board surfaces with a tile backer board sealer supplied or recommended by board manufacturer. Provide corner beads at outside corners and casing beads at exposed edges. Embed joint tape and treat fasteners with joint compound; apply at least two coats of joint finishing compound on joints. Flat trowel a skim coat of joint compound over exposed backer board surfaces to fill all voids, allow to cure, and then sand to provide a smooth finish surface. Use only board manufacturer's water-resistant finishing materials.

END OF SECTION

SECTION 09300

TILE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide ceramic tile finish as indicated and specified, complete.

A. Work Included:

1. Tile finish for walls, bases, and floors.
2. Expansion joints.
3. Marble thresholds at tile floors.

B. Related Work:

1. Gypsum board and concrete backings for tile.
2. Concrete subslabs.
3. Metal thresholds.

1.02 REFERENCES: The Work shall conform to the reference standards and specifications of the issues listed below (refer to Section 01420 if issue date is not listed), to requirements indicated and specified, to required fire ratings, and to the pertaining regulatory requirements of authorities having jurisdiction. The specifications, codes, publications, and standards listed, but referred to hereafter by the basic designation only, form a part of this Section to the extent referenced herein:

A. American National Standards Institute (ANSI):

A108.1-92	Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile Installed With Portland Cement Mortar.
A108.5-92	Ceramic Tile Installed With Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
A108.10-92	Installation of Grout in Tilework.
A118.1-92	Dry-Set Portland Cement Mortar.
A118.4-92	Latex-Portland Cement Mortar.
A118.6-92	Ceramic Tile Grouts.
A137.1-88	Standard Specifications for Ceramic Tile.

B. Tile Council of America (TCA): Handbook for Ceramic Tile Installation, 2003 Edition.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit the following:

1. Tile manufacturer's printed data identifying each field tile unit and each trimmer and shaped unit by manufacturer's model or type number.
2. Manufacturer's printed directions for latex mortar and waterproofing.

B. Shop Drawings: Submit showing dimensioned layouts for all tiled wall and floor surfaces. Show locations of tile joints, cuts, and trimmers. Identify trimmers and accessory units by type number stated in the approved Product Data.

C. Samples: Obtain the Architect's instructions and submit the following for selection and approval:

1. Each type, shape, and trimmer of tile in each color proposed for use.
2. Grout colors for each type of tile.
3. Cured sealant colors for expansion joints in tile.
4. Marble thresholds, 12" lengths, with one end cut and finished to fit typical door jamb.

D. Master Grade Certificates: Submit for each lot of tile before installing.

1.04 DELIVERY AND STORAGE: Deliver tile materials to site in unopened factory containers sealed with Grade Seals bearing printed name of manufacturer and the words "Standard Grade". Keep the grade seals intact and containers dry until tiles are used. Keep cementitious materials dry until used.

1.05 PROJECT/SITE CONDITIONS: Install temporary protection as required; do not use wood or another material likely to stain or deface installed tile. Close tile floors to all traffic completely for 72 hours after the tile installation and curing is completed; thereafter, permit traffic only over a protective covering of heavy paper or equivalent. Refer to Section 01740 regarding protection of flooring until final cleanup of the Work.

1.06 MAINTENANCE MATERIALS: Conform to Section 01770. Deliver to the Owner in tile manufacturer's labeled cartons or boxes not less than following quantity of tile materials which are identical to the installed tile:

A. 25 square feet of each type, size, color, and finish of wall tile with five linear feet of matching cove base and a supply of matching trimmers.
B. 25 square feet of each type, size, color, and finish of floor tile.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS:

A. Latex Mortar: ANSI A118.4 except factory inclusion of aggregate is not required.

B. Latex Admix: For joint grout, same manufacture as above latex mortar.

C. Latex Waterproofing: By the same manufacturer as above latex mortar, fibrous glass reinforced, 1/16" to 1/8" thickness, for thin-set tile installations

D. Color pigments: Pure ground mineral oxides, non-fading, alkali and lime proof, factory weighed and packaged.

E. Joint Sand: ASTM C144, except all passing the No. 30 sieve.

2.02 TILE MATERIALS: Standard Grade conforming to ANSI A137.1 and of types and manufacture as scheduled at the end of this Section.

A. Restrictions: Perforated paper backed tile is not acceptable where paper remains as a permanent part of the installation. Mesh mounted tile is allowed if mesh is of small strings and openings are at least 1/4" clear size. Under no circumstances will glazed tile installations be accepted if any part of unglazed tile body of any unit remains exposed after tile is installed. Provide matching tile trimmers required to prevent such condition.

B. Tile Types: Matching Master Samples on file in Architect's office and as specified on the Drawings.

2.03 TILE JOINT GROUT: Latex-portland cement type grout consisting of waterproofed portland cement (white for walls and gray for floors), latex admix, and a color pigment, cured dry color matching approved Samples. Include silica sand passing No. 30 sieve for joints over 1/8" wide in amount equal to the volume of portland cement.

2.04 MARBLE THRESHOLDS: Group "A" marble as classified by the Marble Institute of America, 1-piece units with honed finish and rounded edges, accurately cut to profile of door jambs, color as selected, matching approved Sample.

PART 3 - EXECUTION

3.01 PREPARATION: Clean substrates of dust, dirt, oil, grease, and deleterious substances. Conform to applicable Reference Standards and to recommendations of manufacturers of materials used.

A. Gypsum and Cement Board Backings: Prime surface with latex primer or admix if required by the instructions of latex mortar manufacturer.

B. Latex Waterproofing: Apply according to manufacturer's directions, sealed into floor drains and turned up at walls. Pond test for 24 hours, repair leaks, and retest until no leakage occurs. Provide latex waterproofing under thin-set tile floors in toilets except at slabs on grade, and elsewhere indicated.

3.02 TILE INSTALLATION: Arrange tile surfaces according to patterns detailed or approved. Accurately set all tile with flush well-fitted joints, finished in true planes, plumb, square, sloped or level as required. Neatly cut and fit the tile close against abutting surfaces. Construct joints of uniform width. Form corners, returns, and exposed tile edges with approved trimmers. Drill and cut tile without marring. Carefully grind and joint tile edges and cuts. Fit tile close around outlets, pipes, and fixtures so that escutcheons or collars overlap tile. Arrange tile surfaces so that not less than half-size tile occurs. Drill holes for pipe penetrations through wall tile; do not cut or split tile and set with tight ungrouted joint. Quarter-round tile trimmers are not permitted.

A. Thin-Set Tile: Mix latex mortar according to manufacturer's instructions. Do not dampen thin-set tile. Conform to instructions of both the latex mortar and tile manufacturers. Apply latex mortar only to areas no larger than can be covered with tile within 30 minutes. If installing tile over elastomeric sheet membrane waterproofing, use a notched trowel with a notch depth that compensates for waterproofing lap thickness so that finish floor is in a true plane. Remove all traces of mortar from tile surfaces before latex mortar sets.

B. Joint Sizes: Install tile with uniform 1/8" joint width.

C. Ceramic Tile Joint Grouting: Grout tile joints full after washing out and saturating with clean water. Mix grout with water to a thick creamy consistency and force into joints for entire joint depth, flush with surface. Clean off all excess and fill skips and gaps before grout sets. Provide dampness for minimum 3-day curing and polish with clean dry cloths.

D. Calking: Calk penetrations through wall tile with latex mortar or sealant conforming to Section 07920, concealed by collars or escutcheons.

3.03 EXPANSION JOINTS - THIN SET HORIZONTAL SURFACES: Provide urethane polymer sealant conforming to Section 07920 for full depth of expansion joint, color to match joint grout. Install expansion joints at toe of cove base. If not shown, provide expansion joints in the same manner at maximum 192" centers both ways in the tiled areas, locations as directed. Provide sealant joints matching color, width, and appearance of grouted joints but minimum 1/8" wide.

3.04 CLEANING: Conform to Section 01740. Remove stains, cement, grout, and foreign matter after grouted joints are fully set. Do not use any acid for cleaning. Repair all defective joints as approved. Conform to Section 01740 and remove from the site surplus materials, waste, and debris resulting from Work of this Section.

END OF SECTION

SECTION 09510

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide acoustical unit ceilings, complete.

A. Work Included:

1. Suspended exposed t-bar metal ceiling grid system for acoustical panels and tile.
2. Suspended t-bar metal ceiling grid system for direct application of gypsum board.
3. Wet-formed mineral fiber acoustical panels and acoustical tile.

B. Related Work:

1. Gypsum board ceiling finish - Section 09250.
2 Air conditioning grilles and fixtures - Division 15.
3. Lighting fixtures and wiring - Division 16.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit reflected ceiling plans.

1. Indicate types of units, layout and pattern of units, details of suspension systems, details at changes of level, details of ceiling penetrations and other interruptions, edge treatments, and all necessary connections with adjoining Work.
2. Show all lighting fixtures, HVAC diffusers and grilles, access doors, and similar products set into ceiling.

B. Samples: Submit Samples of acoustical units and each grid component, metal trims, and moldings.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements:

1. Suspension system -- conform to UBC Standard 47-18.
2. Conform to UBC for combustibility requirements for materials.
3. Comply with UBC requirements for vertical and lateral seismic bracing.

B. Sequencing and Scheduling: Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and the overhead Work is completed, tested, and approved. Schedule installation of acoustical units after interior wet Work is dry.

1.04 DELIVERY, STORAGE, AND HANDLING: Deliver materials to the site in manufacturer's original unopened containers. Keep all materials dry, clean, and protected from deterioration.

1.05 PROJECT CONDITIONS: Verify the locations of various electrical and mechanical fixtures and equipment items installed above ceilings and the required access to dampers, valves, controls, and similar items. Coordinate locations of hanger wires and ceiling installations with all such fixtures and equipment to obtain neat symmetrical result with minimum cutting or patching of acoustical units.

1.06 WARRANTY: Refer to Section 01790. Furnish to the Owner a warranty against defects in materials or workmanship, including sagging or disconnection of grid systems or disintegration of acoustical units, for 3 years.

1.07 EXTRA MATERIAL: Conform to Section 01770. Deliver to each Tenant and the Owner, in sealed and labeled cases, extra material described below and matching the installed products, at least 10 full size acoustical units of each type, and four 4-foot lengths of each type and color of exposed suspension system components.

PART 2 - PRODUCTS

2.01 GRID SUSPENSION SYSTEMS: Designed to support the acoustical ceiling loads with deflections not over 1/360 of spans, all systems manufactured of electro-galvanized steel.

A. Manufacture: By USG Interiors, Ceiling Suspension Division (Donn), or approved equivalent by Armstrong World Industries or Chicago Metallic Corp.

B. Suspended Grid for Lay-In Acoustical Panels: Donn DX Acoustical Suspension System.

1. Double web design, 1-1/2" high, rectangular top bulb 1/2" deep, bottom flange 15/16" wide.
2. Intermediate duty classification.
3. Manufacturer's standard low-gloss paint finish to match color of acoustical units with simulated texture pattern.

C. Suspended Grid for Direct Application of Gypsum Board: Donn Rigid X Drywall Suspension System.

1. Single web design, main tees 1-1/2" high, round top bulb, bottom flange 15/16" wide. Main beams and cross furring members interlock to form modular supporting grid capable of supporting directly attached gypsum board.
2. Intermediate duty classification.
3. Manufacturer's standard factory white paint finish.

D. Trims and Moldings: Minimum 0.024" thick zinc-coated steel for non-fire-rated ceilings, exposed surfaces factory painted with low luster enamel in color to match grid.

E. Hanger Wires: ASTM A641, 12 gage soft-temper pre-stretched galvanized annealed and straightened steel wires; furnish heavier gage if required by Building Code or UL Design Approval for ceiling grid system furnished or grid interval involved.

F. Braces and Supports: Galvanized steel, sizes and types to suit the application, to rigidly support and secure ceiling system including support of mechanical and electrical components bearing on grids with L/360 maximum deflection. Seismically brace ceiling grids in accordance with Code.

1. Mild steel hanger rods, zinc coated or having rust inhibitive paint.
2. Flat hangers, mild steel zinc coated or having rust inhibitive paint.

G. Vibration Isolators: Where indicated or specified, equip the hanger wires with isolators similar and equal to Mason Industries Inc. Type W30N Combination Neoprene Element and Spring Hanger.

2.02 WET-FORMED MINERAL FIBER ACOUSTICAL PANELS: By USG Interiors; no substitution.

A. Flame Spread Rating: Incombustible acoustical units rated 0 to 25 flame spread rating (Class I) per ASTM E84 Tunnel Test.

B. Type: Lay-in mineral fiber panels for exposed tee suspension system, Fed Spec SS-S-118B, Type III, Form 2, Pattern CDFIK, Class A, "Aspen Illusion" Two/24 Panels, 24" x 48" x 3/4" thick panels, white; no substitution.

2.03 ACOUSTICAL TILE EDGE TRIM: Rolled galvanized steel profile, white paint of color to match the acoustical units.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to the Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

3.02 GENERAL INSTALLATION REQUIREMENTS: Install ceilings under supervision of an experienced superintendent. Consult with and coordinate installation with related trades. Install suspended ceilings level within a tolerance of 1/8" in 12-feet in all directions. Conform to ASTM C636, ASTM E580, UBC, UBC Std. 47-18, CISCA Ceiling System Handbook, manufacturer's instructions, approved submittals, and as specified herein. install ceilings after major above-ceiling Work is completed. Coordinate hanger wire locations with related Work.

A. Pattern: Unless otherwise indicated or specified, install ceilings in a regular pattern without borders, joint lines parallel to walls. Install units symmetrically about centerlines of each room or space, avoiding narrow units at walls; no cut units less than 1/2 panel width. Cut and closely fit units to ceiling penetrations.

B. Framing For Lighting and Mechanical Devices: Obtain information from involved trades and provide additional hanger wires, grid framing members, and supports in grids as required for lighting and mechanical fixtures, equipment, and other loads imposed on grids, with a safety factor of 4.0 minimum. Provide main grid tees along edges of mechanical devices and lighting fixtures bearing on the grids.

C. Seismic Bracing: Provide splayed seismic bracing wires as shown and required by Code; fully detail in Shop Drawings.

3.03 SUSPENDED GRID CEILINGS: Conform to the UL Design Approval for the grid.

A. Hanger Wires: Space hanger wires at maximum 48" centers along main tees and connect to structure above as shown in approved Shop Drawings, minimum of a single wrap and 3 twists of wire within a 2" distance overall from the single wrap.

B. Vibration Isolators: Provide isolators on all hanger wires located below and within 10-feet horizontally of the rooms, spaces, or roof decks containing or supporting mechanical equipment.

C. Grid Members: Install main tees at maximum 48" centers and install cross tees to complete the grid. Lock all suspension members together to form joints that resist not less than 200 pounds in tension and compression. Cope bottom flanges of tees, where exposed, for flush tight connections with metal trims at vertical surfaces.

D. Exposed Grid Acoustical Units: Place units with edges bearing on tees and secure with hold-down clips on all edges; omit the hold-down clips where access to above-ceiling controls, valves, and similar devices is required. Closely fit units to grid supports and ceiling penetrations.

1. Arrange acoustical units and orient directionally patterned units as shown in reflected ceiling plans or, if not shown, as directed by the Architect.
2. Edges of all acoustical units shall be concealed by grid members.
3. Field rabbet cut panel edges at borders to match factory beveled "tegular" edge.

E. Trims and Moldings: Provide painted metal trims and moldings at walls and other vertical surfaces and penetrations, with joints closely butted, mitered at angles, and flush. Lapped joints are not permitted.

F. Ceiling Offsets: Provide framing, trims, and other finishing materials as indicated or required to properly finish at offsets or ceiling breaks, types as indicated, directed, and approved.

3.04 REPAIR, CLEANING, AND COMPLETION: Conform clean-up and disposal to Section 01740. Remove and replace all discolored, broken, or damaged materials. Completed ceilings shall present a smooth plane surface free of edge or corner offsets or breaks, cupping, scratches, gouges, stains or hand marks, or other defects. Clean exposed surfaces and remove foreign matter.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide resilient flooring and base, complete.

A. Work Included:

1. Vinyl composition tile flooring.
2. Rubber straight wall base (no cove).
3. Reducer strips and trims.
4. Black color patterned sheet rubber flooring.

1.02 REFERENCES:

A. American Society for Testing and Materials (ASTM):

D3564-95 .....Practice for Application of Floor Polishes to Maintain Vinyl Composition Tile or Flooring.
D4078-92(96) .....Water Emulsion Floor Polish.
F710-98.....Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
F1066-99 .....Vinyl Composition Floor Tile.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit copies of each flooring manufacturer's recommended standard dryness testing and required test results; each manufacturers' complete technical data for flooring and base materials including primers, adhesives, and leveling compounds manufactured, supplied, or recommended by the manufacturer; the manufacturer's preparation and installation instructions for each type of flooring and base; and copies of flooring manufacturer's certified laboratory test reports demonstrating flooring meets Americans with Disabilities Act (ADA) slip-resistance requirements. Also submit evidence flooring polish meets the ADA slip-resistance requirements and VOC requirements.

B. Samples: Submit full-size Samples of each scheduled color or pattern of flooring, base, and stair tread for final approval. Submit Samples of each reducer strip and trim.

C. Moisture Testing Results: Submit written reports covering concrete slab moisture testing results for record purposes only and not for approval.

1.04 DELIVERY, STORAGE, AND HANDLING: Deliver materials in the manufacturer's original unopened labeled containers. Store all flooring and base materials at minimum 70°F for 48 hours before installing. Handle flooring cartons carefully to prevent damage to contents.

1.05 PROJECT/SITE CONDITIONS: Do not install any flooring until satisfactory moisture testing results are obtained and Work of other trades is substantially completed, including painting. Keep installation areas and materials at minimum 70°F during and for 10 days after flooring and base installation is completed. Maintain adequate ventilation for the removal of moisture and fumes.

1.06 EXTRA MATERIALS: Conform to Section 01770. Deliver following maintenance materials to the Owner in unopened factory containers or sealed labeled cartons identifying contents, matching installed materials. Include unopened containers of adhesives adequate to install the maintenance materials.

A. Vinyl composition tiles, 180 square feet of each color and pattern.
B. Wall base, at least 100 lineal feet with 20 end stop units, 20 outside corner units, and 20 inside corner units, of each color and height used.
C. Black rubber flooring, 10% of installed flooring in large size pieces or rolls.

PART 2 - PRODUCTS

2.01 MATERIALS: Colors and patterns as scheduled on the Drawings or as selected by the Architect.

Vinyl composition tile:..... Equal to or exceeding ASTM F1066, asbestos free, 12" square by 1/8" thick, patterns as shown on the Drawings or directed.

Rubber base:..... Straight base type, 4" height, with matching molded inside and outside corners and end stops, coil lengths wherever feasible for minimum field joints; by Burke or Johnsonite (depending on selected color).

Black rubber flooring:.....Loncoin I, black color, raised coin pattern sheet rubber, by Lonseal, Inc.,Carson, CA, 800/832-7111.

Setting materials: ..... Adhesives, primers, fillers, and leveling compounds of the types and composition conforming to the approved submittals, factory prepared and factory labeled as to substrates on which application is approved by the manufacturer, meeting VOC requirements.

Reducer strips: ..... Extruded aluminum, brass, or bronze as required to match the room hardware and as approved, edge-butting type not overlapping flooring.

Floor polish: ..... Water emulsion non-yellowing carnauba or vinyl type floor polish, ASTM D4078, labeled as meeting both UL and ADA slip-resistance test requirements as shown in approved submittals, and VOC requirements.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to the Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

3.02 PREPARATION: Cover and protect adjoining Work which may be damaged during Work of this Section. Prior to laying flooring, test concrete substrates for adequate dryness using testing procedure conforming to flooring manufacturer's directions. If tests show concrete contains excessive moisture, continue slab drying and repeat the tests until results are satisfactory.

A. Preparation of Concrete: Conform to applicable requirements of ASTM F710 except as exceeded herein. Clean substrates of all deleterious substances and foreign matter. Fill all cracks and holes with filler or leveling compound of type recommended by flooring manufacturer for specific job conditions. Make floor slabs true to level and plane within a tolerance of 1/8" in 10-feet; test floor areas both ways with a 10-foot straightedge and repair high and low areas exceeding tolerance. Remove the high areas by power sanding, stone rubbing, or grinding, chipping off and filling with leveling compound, or equivalent method. Fill low areas with leveling compound. Use leveling compound of type supplied or recommended by flooring manufacturer for the specific job conditions. Repair and level all surfaces having abrupt changes in plane, such as trowel marks or ridges, whether or not within allowable tolerance. Power sand repair areas and other areas as required to remove surface defects which may "telegraph" through the floor covering. Again clean the areas by vacuuming or equivalent to remove all dust and dirt; do not use water, oiled sawdust, or any similar material to remove dust. Prime concrete slabs if so recommended by flooring manufacturer.

3.03 INSTALLATION: Conform to each flooring manufacturer's recommended installation procedures in approved submittals; requirements specified herein govern whenever exceeding the manufacturer's recommendations. Provide flooring in cabinets and casework without bottoms, and provide flooring and base in closets; install the same flooring as is installed in the room unless otherwise indicated.

A. Vinyl Composition Tile Installation: Mix sufficient quantity of tiles to complete each area before laying to avoid color variations. Install flooring with tight joints, pattern direction as approved. Lay flooring square with axis of rooms, starting on center lines with tile joint or tile center so that border tiles are not less than 4" wide, accurately aligned. Cut flooring mechanically to produce square true edges. Closely trim to pipes, jambs, outlets, and like conditions.

B. Base Installation: Securely cement to backing in long lengths, minimum 18" long filler pieces, top and toe continuously contacting wall and floor, all joints tight. Provide factory-made internal and external corners, and end stops where cove base ends at jambs and offsets.

C. Reducer Strips: Provide at exposed edges of resilient flooring, secured with matching countersunk screws into lead anchors or equivalent. Closely miter all corners and angles. Place reducer strips under door centerline if required at doorways.

D. Rubber Sheet Flooring: Prepare surfaces and install flooring in accordance with manufacturer's directions, seams virtually invisible and raised coin pattern continuous in both directions. Roll for complete adhesion to substrate.

3.04 CLEANING, POLISHING, AND COMPLETION: Keep floor and base surfaces clean as installation progresses. Clean flooring and base when sufficiently seated and remove foreign substances. Immediately prior to the Owner's acceptance of building, apply at least 2 coats of floor polish on resilient tile flooring (excluding static dissipative tile flooring) in accordance with ASTM D3564 and the polish manufacturer's instructions; machine buff each coat. Clean adjacent surfaces of adhesive or other defacing. Replace damaged or defective Work as approved. Remove waste, debris, unused materials, and tools from the site in accordance with Section 01740.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide and perform painting, complete.

A. Work Included:

1. Submittals.
2. Preparation of surfaces.
3. Painting of all interior surfaces, except as otherwise specified.
4. Painting of all exterior surfaces, except as otherwise specified.

B. Related Work:

1. Shop prime coats and factory finishes.
2. Painting specified as Work of other Sections.
3. Sealants and calking.

C. Surfaces Not To Be Painted:

1. Non-ferrous metal work (other than zinc-coated surfaces) and plated metal, unless particular items are specified to be painted.
2. Surfaces concealed in walls and above solid ceilings.
3. Non-metallic walking surfaces unless specifically shown or specified to be painted.
4. Factory finished surfaces, including fluoropolymer paint finished surfaces under Section 05080.
5. Ceramic tile, plastic, and stone surfaces.
6. Resilient flooring and base.
7. Surfaces indicated not to be painted.
8. Surfaces specified to be finish painted under other Sections.
9. Surfaces in Tenant Lease spaces unless indicated, specified, or scheduled to be painted.

1.02 AQMD RULES: Furnish paint materials that conform to the current rules and regulations of all governing Air Quality Management Districts and other public environmental control and protection agencies having jurisdiction. If any paint materials specified herein do not conform to said rules and regulations, paint manufacturer of proposed paint materials shall prepare a list of non-conforming specified painting materials and proposed substitute conforming paint materials; Contractor shall deliver list to the Architect for review. Refer to Section 01630 regarding substitutions.

1.03 SUBMITTALS: Refer to Section 01330 for procedures.

A. List of Paint Materials: Prior to submittal of Samples, submit a complete list of proposed paint materials that identifies each material by manufacturer's name, product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended usage, and preparation and application methods. Identify surfaces to receive various paint materials. Do not deviate from approved list.

B. Color Samples: Prior to submittal of Samples obtain Architect's color and gloss selections for finishes not scheduled herein. Using materials from approved list, prepare and submit 8-1/2" by 11" Samples of each complete opaque paint finish. Prepare natural or stain finish Samples on 12" squares of same species and appearance of wood as used in the Work.

1.04 PROJECT/SITE CONDITIONS: Protect all painting while in progress and cover and protect adjoining surfaces and property of others from damage. Exercise care to prevent paint contacting surfaces not to be

painted. During painting of exterior work, cover windows, doors, concrete, and other surfaces not to be painted.

A. Weather Conditions: Apply paint to clean, dry, prepared surfaces. Do not apply exterior paint during rainy, damp, foggy, or excessively hot and/or windy weather. Arrange for temporary heat and ventilation for interior painting.

B. Precaution: Place oily rags and waste in self-closing metal container and remove from site at the end of each day. Do not let rags and waste accumulate.

PART 2 - PRODUCTS

2.01 MATERIALS: Use the paint products of only one paint manufacturer unless otherwise specified or approved. In any case, primers, intermediate, and finish coats in each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades. To the maximum extent feasible, factory mix paint materials to proper color, gloss, and consistency for application. Frazee Paint Company products specified herein designate intended types and qualities. Furnish paints from one of the following manufacturers: Frazee, Dunn-Edwards, ICI Group, Benjamin Moore.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710, Article "Verification of Conditions". Examine all surfaces to be finished under this Section and verify satisfactory condition. Report to Architect in writing all those conditions that prevent or interfere with correct preparation and application of Work of this Section. Do not proceed with painting and finishing on involved surfaces until all reported conditions are corrected. Application of the first coat of any finishing system constitutes acceptance of the surface by Painting Subcontractor. This does not relieve Contractor from proper preparation of surfaces.

3.02 WORKMANSHIP: Apply each paint material in accordance with manufacturer's instructions by brush or roller; spray painting is not allowed without specific approval in each case. Apply each coat at the proper consistency, free of brush or roller marks, sags, runs, or other evidence of poor workmanship. Do not lap paint on glass, hardware, and other surfaces not to be painted; apply masking as required. Sand between enamel coats.

3.03 PREPARATION: Properly prepare surfaces to receive finishes.

A. Concrete: Fill all cracks, holes and other blemishes with portland cement patching plaster or a stiff paste mixed of finish paint and fine sand, finished to match adjoining surfaces. Remove surface glaze by sanding, wire brushing, or light brush-off sandblasting. Neutralize all alkali conditions according to the paint manufacturer's directions. Dry surfaces to receive a breathing type latex paint at least two weeks, free of visible moisture, and dry surfaces to receive oil, alkyd, or epoxy based paint until the moisture content does not exceed 8% when tested with an electronic moisture-measuring instrument.

B. Masonry: Repair minor holes and cracks with a stiff paste of finish paint and fine sand or vinyl type block filler. Report major or unsightly defects to the Architect for correction. Neutralize all alkali and efflorescence according to paint manufacturer's directions.

C. Exterior Plaster: Fill hairline cracks with portland cement patching type material; report larger cracks to the Architect for correction. Test and ensure plaster is sufficiently dry to receive the paint finish. For plaster to receive Elastomeric Exterior Wall Coating, only cracks larger than hairline size need to be corrected.

D. Gypsum Wallboard: Touch-up minor defects with spackle and sand smooth and flush. Report other defects for correction as specified.

E. Shop Coated Metal: Degrease and clean of foreign matter. Clean and spot paint field connections, welds, soldered joints, burns, or abraded portions with same material used in shop coat. After complete hardening, sand entire surfaces for coat to follow.

F. Uncoated Ferrous Metal: Degrease and clean of dirt, rust, mill scale, and all other foreign matter using rotary brushes, solvent, or sandblasting. Remove pits and welding slag, and clean surfaces to bright metal before priming. Apply metal primer not more than three hours after preparation.

G. Galvanized Metal and Aluminum: Degrease and clean of foreign matter. Apply specified pretreatment and immediately apply primer paint as soon as pretreatment is dry.

H. Fixtures, Equipment, and Hardware Items: Cooperate with other trades and coordinate removal of fixtures, equipment, and hardware as required to perform painting. Items to be removed include, without limitation: signs and graphics; switch and receptacle plates; escutcheons and like plates; all surface-mounted equipment; free-standing equipment blocking access; grilles and louvers at ducts opening into finished spaces; and other items as required and directed.

I. Surfaces Not Mentioned: Prepare surfaces according to recommendations of the paint manufacturer and as approved.

3.04 COATS AND COLORS: The number of paint coats specified to be applied are minimum. Ensure acceptable paint finishes of uniform color, free from cloudy or mottled areas and evident thinness on arrises. "Spot" or undercoat surfaces as necessary to produce such results. Tint each coat a slightly different shade of finish color to permit identification. Conform to the approved Samples. Obtain approval of each coat before applying next coat; otherwise, apply an additional coat over entire surface involved at no additional cost to Owner.

3.05 EXTERIOR PAINTING:

A. Concrete:

1st Coat:	266 Epotilt
2nd Coat:	202 Duratec

B. Cement Plaster: Dunn-Edwards Elastomeric Exterior Wall Coating:

1st Coat:	D-E Super-Loc (W718 or Eff. Stop W709)
2nd & 3rd Coat:	D-E Endurawall Smooth W370, applied in 2 coats of equal thickness, total dry film thickness of 15-20 mils

C. Metal - Ferrous:

1st Coat:	664 Rust Stop Primer
2nd Coat:	381 Super Bond
3rd Coat:	221 Acri-Lite

1. Exception: On exterior and interior sides of steel door frames, apply 2 coats of 648 Aro-Plate Industrial Enamel in lieu of the 2nd and 3rd Coats above.

D. Metal - Galvanized: Treat with Jasco Prep N'Prime pre-treatment before priming.

1st Coat:	661 Metal Prime
2nd Coat:	381 Super Bond
3rd Coat:	221 Acri-Lite

1. Exception: On roof and wall flashings, wall louvers, and other sheet metal flashing visible on building exterior surfaces and not finish painted under Section 05080 or other Sections, apply two coats of 202 Duratec in lieu of 3rd Coat above (total of 4 coats in addition to vinyl wash primer).

3.06 INTERIOR PAINTING: Provide paint finishes as scheduled on the Drawings or directed, gloss of finishes as scheduled or, where not scheduled, as designated by the Architect.

A. Enamel Finishes: Of following glosses:
   1. Gloss Enamel - 143 Mirro Glide GL
   2. Semigloss Enamel - 021 Satin Glide
   3. Eggshell Enamel - 022 Lo Glo

B. Flat - Drywall:

1st Coat:	002 Majestic
2nd Coat:	002 Majestic

C. Enamel - Drywall:

1st Coat:	061 Aqua Seal
2nd Coat:	Enamel, gloss as scheduled or designated
3rd Coat:	Enamel, gloss as scheduled or designated

D. Enamel - Wood:

1st Coat:	367 Fraflo
2nd Coat:	Enamel, gloss as scheduled or designated

E. Flat - Metal: Treat galvanized metal with Jasco Prep N'Prime.

1st Coat:	661 Metal Prime for galvanized metal 664 Rust Stop Primer for ferrous metal
2nd Coat:	367 Fraflo for galvanized and ferrous metal
3rd Coat:	002 Majestic for ferrous metal only

F. Enamel - Metal: Treat galvanized metal with Jasco Prep N'Prime.

1st Coat:	661 Metal Prime for galvanized metal 664 Rust Stop Primer for ferrous metal
2nd Coat:	367 Fraflo
3rd Coat:	Enamel, gloss as scheduled or designated

   1. Exceptions:

      a. On exposed surfaces of steel stairs, steel pipe or tubing railings on steel stairs or on walls, and all surfaces of steel door frames, apply 2 coats of 628 Aro-Plate Semigloss Enamel in lieu of 2nd and 3rd Coats above.
      b. On stair tread and landing nosings at top and bottom of each stair run, apply a minimum 2" wide stripe of floor paint, contrasting color designated by the Architect, for conformance with Code and ADA requirements.

3.07 MISCELLANEOUS PAINTING:

A. Duct Interiors: Paint with flat black fire-retardant paint to the extent visible through grilles and registers in finished rooms and spaces.

B. Fire Extinguisher and Fire Hose Cabinets: Apply 2 coats of paint finish, inside and out, matching finish and color of adjoining areas, unless otherwise noted or directed.

C. Weatherstripping or Sound Seals: Paint all exposed metal surfaces of the seals to match the door frame, whether or not unfinished, furnished with factory prime coat, or factory treated for paint adhesion.

D. Mechanical and Electrical Work: Carefully review Divisions 15 and 16 of these Specifications regarding painting performed thereunder and other painting required to be performed under this Section. Perform painting of mechanical and electrical equipment and materials not expressly specified to be painted as part of Work of Divisions 15 or 16, including required identification and color code painting, stenciling, and paint banding.

E. Interior Parking Areas: Paint all concrete, concrete block, and shotcrete walls and columns with one coat of white Alkyd Mill White except where another finish is scheduled.

F. Painted Signs: Provide on walls in interior parking areas as indicated or directed. Paint signs as specified for interior enamel. Employ an experienced and skilled sign painter.

G. Miscellaneous: For any items not specifically indicated or specified that require a paint finish, apply 3 coats of paint as directed.

3.08 CLEANING AND TOUCH-UP WORK: Make a detailed inspection of paint finishes after all painting is completed, remove spatterings of paint from the adjoining surfaces, and make good all damage caused by cleaning. Carefully touch-up all abraded, stained or otherwise disfigured painting, as approved, and leave entire painting in first-class acceptable condition.

END OF SECTION

SECTION 09965

ELASTOMERIC COATINGS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide elastomeric coating on floors and bases of Mechanical Equipment Rooms and spaces of the Building (not the garage mechanical rooms), complete. Further, provide elastomeric coatings on the building floor and base slabs, and in trench drains, indicated to receive "Elastomeric Waterproofing".

A. Related Work: Calking and sealing except as specified herein.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit coating manufacturer's technical materials, systems, preparation, application data, and specifications, with copies of Code approval for each system proposed for use. Prepare specifications specifically for the conditions shown on Drawings. Include a typed list of at least 5 installations, with owner's names and addresses, on which proposed system has been in service for at least 3 years without failure of any kind.

B. Samples: Submit Samples of coating system in selected colors, showing the texture and colors for approval. After selection, submit 12" square Samples of system prepared on rigid board.

C. Applicator's Qualifications: Submit evidence that either the manufacturer will install coatings or that applicator is licensed and approved by manufacturer.

D. Certificate: At completion, the Contractor and coating manufacturer shall inspect coatings and deliver to Architect a certificate that installed materials and workmanship conform to requirements specified herein.

1.03 QUALITY ASSURANCE: Provide coating system conforming to VOC rules and to Code, bearing UL Class B or better label or listing. Employ the elastomeric coating manufacturer or manufacturer's authorized applicator to perform preparation and install elastomeric coating system.

1.04 PRODUCT DELIVERY: Deliver materials to site in sealed factory containers, seals unbroken, labels intact and bearing date of manufacture and brand name.

1.05 PROJECT/SITE CONDITIONS: Coordinate with related trades, verify concrete surfaces are correctly finished, water or sheet cured without the use of curing compound, and are dry. Set temporary protection to prevent staining or marring of surfaces not to be coated. Keep traffic off coatings until cured and fully set. Ensure areas to receive coatings are ventilated and that coating fumes are discharged to exterior.

1.06 WARRANTY: Conform to Section 01790. Contractor and coating manufacturer shall furnish to Owner a joint and several warranty against defects in materials or workmanship for 3 years covering waterproofing performance of the systems for full warranty period and accepting responsibility for any ruptures in coatings caused by cracking of the substrate up to 1/16" in width. Defects covered under the warranty shall include, without limitation, loosening, softening, abrasion, blistering, loss of either adhesion or cohesion, coating delamination, damage by fuel or lubricants, and penetration of water.

PART 2 - PRODUCTS

2.01 COATING SYSTEMS: Provide walking surface coatings with a non-slip texture by incorporation of silica sand into system and not by splatter texturing finish coat. Conform cured coating thickness to coating manufacturer's published data sheet for heavy duty coatings which is minimum acceptable total cured thickness. Provide Neogard "Pedagard" or 3M System VHD; refer to Section 01630 regarding proposed substitutions.

A. Color and Texture: Provide finish coating colors as selected by the Architect from the manufacturer's standard colors.

B. Primer: Provide two-component epoxy-polyamide primer-sealer or equivalent epoxy primer, of low viscosity, supplied by the coating system manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 Article "Verification of Conditions", and verify that substrates are correctly finished, water or sheet cured without the use of membrane-forming curing compounds, and are dry. Report to Architect in writing conditions that prevent or interfere with the correct installation of Work of this Section. Do not proceed with installation in involved areas until reported conditions are corrected. Applying first coat of any system indicates acceptance of surface for warranty purpose; this does not relieve Contractor and applicator from full responsibility for proper preparation of surfaces.

3.02 PREPARATION OF SURFACES: Conform to coating manufacturer's directions and broom sandblast, acid etch and neutralize, mechanically clean, or perform other cleaning operations as necessary to produce clean sound dry surfaces in correct condition for the coatings. Rout out substrate cracks over 1/16" wide at least 1/4" wide and deep, fill flush with elastomeric sealant, then apply primer and stripe with membrane material to at least 3" on each side of calking. At cracks 1/16" wide or less, apply primer to at least 3" on each side of crack, and coat primer with a double application of coating material. Apply coating material to cured 30 mils per coat for striping crack areas. Prepare all vertical surfaces and drain connections prior to application of main coating. When preparation is complete, apply primer on all surfaces to be coated. Coat applied primer within 16 hours with first application of coating system; otherwise, reprime the surfaces.

3.03 APPLICATION: Use equipment designed for systems. Apply each coat to the required thickness. Produce finished coatings of uniform color and appearance, free of sags, lap marks, or other defects, matching approved Samples.

3.04 COMPLETION: Remove protective coverings and clean materials from surfaces not to be coated; restore damaged finish as required. If surfaces adjoining the coatings are stained and cleaning is not approved, remove all affected Work and provide new conforming Work as directed, at no extra cost to the Owner.

END OF SECTION

SECTION 10160

METAL TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide painted metal type toilet compartments and urinal screens, complete.

A. Work Included: Principal items include:

1. Floor-mounted toilet compartments.
2. Wall-mounted urinal screens.

B. Related Work:

1. Toilet accessories.
2. Concealed backing or blocking in walls.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit catalog data for each hardware item and fitting, and include evidence latching hardware meets ADA requirements.

B. Shop Drawings: Submit showing dimensioned layouts, the required location of backing in walls, connections to floor supports, preparation and reinforcing of panels to receive the various toilet accessories and grab bars, and erection diagrams.

C. Samples: Submit Samples of metal finishes in designated colors.

D. Certificate: Submit manufacturer's certificate attesting that the steel, treatment, and finish provided conform to requirements specified.

PART 2 - PRODUCTS

2.01 TOILET COMPARTMENTS: Floor-mounted flush panel type painted steel toilet compartments, two or more standard colors as selected, as specified on the Drawings or one of following subject to conformance with requirements indicated and specified; refer to Section 01630 regarding substitutions:

Global Steel Products Corp. "Regal".
Metpar Steel Products Corp. "FT-700 Luxor".
Sanymetal Products Co. "Normandie".
Accurate Partitions Inc. "Bayport".
Weis/Robart Partitions "Floor Braced".

A. Construction. As standard with the manufacturer, modified as necessary to suit the installation requirements, using galvanized bonderized steel of minimum 22 gage for compartment doors 20 gage for partitions, and 16 gage for pilasters; with galvanized steel adjustable connector to secure the pilasters to floors and one-piece polished stainless steel shoes with concealed clips at floor. Prepare reinforced cutouts in partitions where required for toilet accessories. Provide concealed reinforcements for grab bar connections to the panels, designed for at least 300 pound shear load.

B. Hardware: Polished stainless steel, chrome-plated nonferrous metal, or of polished anodized aluminum, as standard with the partition manufacturer. Equip doors with concealed adjustable hinges, coat hook with bumper, latch bolt, and combination stop and keeper. Assemble compartments with metal brackets matching

hardware. Use theftproof fasteners of matching materials. Provide latch bolts that release when door is lifted, allowing emergency access to the compartments. Latching hardware shall meet ADA requirements.

C. Paint Finish: Factory-applied oven-baked inhibiting type primer and baked enamel paint coats on exposed zinc-coated surfaces, with minimum 1.5 mils total dry film thickness.

D. Urinal Screens: Same construction, thickness, and finish as compartment partitions, 18" by 42" size unless otherwise indicated, installed with at least two pairs of finished metal brackets secured with matching machine screws into concealed wall backing.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01410, Article "Verification of Conditions" and report to Architect in writing all conditions that interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

3.02 INSTALLATION. Assemble the compartments and partitions plumb, square, and in true planes without warp or wind, and with connections made tight and secure. Remove dented, punctured, defaced, stained, scratched, improperly fitting, and otherwise defective materials and provide new materials. Fully refinish marred, abraded, and lightly scratched material only when authorized in advance, subject to approval of completed refinishing.

3.03 CLEANING UP: Conform cleaning up to Section 01740. Leave completed metal toilet compartments and related items clean, free of oil, grease, handmarks, and other foreign matter, and with hardware adjusted for correct operation.

END OF SECTION

SECTION 10210

WALL LOUVERS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. By "design-build procedure" (refer to Section 01150), provide metal wall louvers complete with bird screens and factory paint finish as specified, including matching sill flashings as indicated or required.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings and Data: Submit Shop Drawings and the manufacturer's Product Data for all louvers. Show the conditions for every member, joint, and anchorage; include coordination details and erection diagrams, and provisions for expansion and contraction. Show percentage of free area of louvers. Include test reports of tests performed on proposed louvers in accordance with AMCA Standard 500 and that louvers conform to the requirements of Article "Quality Assurance". Include evidence the manufacturer is an AMCA Licensee.

B. Samples: Submit Samples of each finish specified, on aluminum having the specified alloy, temper, and thickness of metal required for the Work. Conform to requirements of Section 05080 for paint finish Samples on aluminum. For louvers of galvanized steel, submit Samples of the manufacturer's standard paint finish. Submit Samples of calking sealants in accordance with Section 07920. Obtain the Architect's color instructions before submission of Samples.

1.03 QUALITY ASSURANCE: Louvers shall have free area at face velocity shown on the Mechanical Drawings, specified in Division 15, or directed by the Architect, and no water penetration at face velocity above 850 FPM when tested for 15 minutes in accordance with AMCA Standard 500.

1.04 PROJECT/SITE CONDITIONS: Verify all involved dimensions and connections to adjoining Work. Obtain field measurements to assure accurate fitting of louvers to other construction. Be responsible for the accuracy of measurements and precise fitting and assembly of finished Work.

1.05 WARRANTY: Conform to Section 01790. Warranty fluoropolymer paint finish in accordance with Section 05080. Warranty sealant calking in accordance with Section 07920.

PART 2 - PRODUCTS

2.01 MANUFACTURE: Louvers shall be essentially standard product assemblies of aluminum, stationary louver blades and frames welded. Louver blades shall be of stormproof profile, set at a 35 degree angle or steeper, free draining to exterior. Louvers shall be as manufactured by The Airolite Company, American Warming and Ventilating, C/S Louver Systems by Construction Specialties, or equal.

2.02 ALUMINUM LOUVERS: Fabricated of extruded aluminum shapes. Provide the blades and frames of minimum 0.081" thick 6063-T5 extruded aluminum.

A. Bird Screens: Provide screens of No. 2 wire mesh (1/2" by 1/2") 0.063" diameter aluminum wire held in rewireable extruded aluminum frames, mounted on interior side of louvers.

B. Blank-Off Panels: Where required, provide insulated blank-off panels of aluminum sheet not less than 0.063" thick.

C. Additional Supports: If required, provide miscellaneous aluminum supports and connections to the building structural system.

D. Sill Flashings: Unless louvers are provided with a flanged frame sealing the bottom members and preventing water entering under the louvers, provide sill flashings under the louvers of minimum 0.032" thick aluminum formed with hemmed turnup behind louvers to divert water to exterior and a blind hemmed turned down flange over the exterior wall finish. Joints in flashings shall be flat locked, riveted where required, and filled with sealant. Flashings shall be sealed at jambs of openings.

E. All Other Materials: Manufacturer's standard for the items required or type best suited for the intended use.

F. Paint Finish: On all louver surfaces, exposed and concealed, provide a fluoropolymer paint finish in accordance with the requirements of Section 05080, color matching approved Sample. Bird screens, sill flashings, blank-off panels and all other aluminum items shall have the same paint finish as the louvers.

PART 3 - EXECUTION

3.01 INSTALLATION: Conform to approved submittals.

A. Isolation: Isolate aluminum from dissimilar materials with exterior quality vinyl tape or gaskets, or with two coats of a moisture-curing single-component urethane polymer coating material, all isolation concealed in the installed Work.

B. Fasteners: Provide heat-treated AN quality aluminum or Type 316 stainless steel fasteners for aluminum louvers, to connect louvers in place, finished to match the louver paint finish where exposed.

C. Setting and Fitting: Set the units level, plumb, and true to line, with uniform joints. Cut and trim louvers during installation only with approval of louver manufacturer and according to the manufacturer's recommendations. Restore paint finish completely to protect material and remove evidence of cutting and trimming; return louvers to finishing plant where exposed paint finish has been damaged for repainting. Remove and replace louvers if cutting or trimming has impaired the strength or appearance.

D. Calking: Provide sealant calking as required for weatherproof connections and including louver connections to adjoining Work; conform calking to Section 07920, sealant color to match paint finish.

3.02 ADJUST AND CLEAN: Remove mortar, plaster, and other deleterious materials from surfaces of aluminum and paint finish immediately.

END OF SECTION

SECTION 10400

SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide signage and graphics indicated and specified, complete. The intent of the Drawings and this Section is for all signage to be complete and the Contractor shall provide all equipment, labor, tools, transport and supplies to fulfill the signage work.

1.02 SUBMITTALS: Refer to Section 01330 for procedures. Shop Drawings and details shall be submitted to the Architect for approval before proceeding with fabrication of signage.

A. Shop Drawings: Submit complete Shop Drawings showing details of sign construction, color, type size and style of letters, sizes of signs, and anchoring details. Drawings issued for bidding are "Drawings of Intent", are representational, and describe the design intent only. Shop drawings shall be submitted for all signs prior to fabrication.

1. Details included on the Shop Drawings may vary from those shown on the Contract Documents if they do not affect the design intent and look of the sign.
2. Shop Drawings shall include full-size details of exposed edges, joints, between materials, and details which effect appearance.
3 Include full-size digital layouts of all copy and symbols for final corrections before fabrication.
4. Include full size patterns with digital type and art for all copy and symbols.
5. After approval of preceding submittals, submit full size patterns with digital type and art for all copy and symbols.

B Final Art and Patterns for Letters: Submit all digital type and art for all copy and symbols for approval before fabrication.

1. Submit full size patterns photographically enlarged to sizes indicated on the Drawings for letter, and word spacing, typography review, and approval.
2. Arrows and symbols -- finished digital art shall be submitted for all symbols and arrows to match Drawings intent. Contractor shall enlarge these to the full size dimensions shown on the Drawings and submit for approval in the correct position in relation to the sign copy and outline shape.

B Sample Signs: Submit for approval one sign of each sign type prior to quantity production of the item. Submit full-size Sample of outline letter forms and numbers in the finish materials for approval before fabrication. Approved Samples will be the standard to which other similar signs will be compared for approval. Approved Samples may be used in the actual sign program.

1. Color Samples: Submit Samples of paint and letters for review of color and texture only. Submit two 3" x 3" color and finish Samples of all colors, materials, and finishes for approval prior to fabrication.

2. Painted Signs - Samples: Color matching for sub-surface acrylic signs shall be matched on the sub-surface of the acrylic and submitted with supplied color Sample for final approval before fabrication.

C. Record Drawings: At the completion of the Work, the Contractor shall deliver to the Architect three sets of updated Record Drawings of signage drawings, location plans, and sign schedules; one set for the Architect and two sets for the Owner.

D. Maintenance Instructions: Signage Subcontractor shall furnish the Owner with complete written care and maintenance instructions for the signs.

1.03 QUALITY ASSURANCE:

A. Code and Permit Requirements:

1. Codes: Work of this Section shall conform to all building and electrical codes for Federal, City, and State and shall be approved and labeled by Underwriter's Laboratories Inc. (UL), where required.

2. Permits: Contractor shall obtain and pay for all permits required for the execution of the signage work. All Title 24 requirements and engineering are the responsibility of the Contractor.

B. Site Visit: Location plans will be furnished to locate and identify all signs. Sign type numbers, which are found in the sign schedule, identify specific sign units and their general locations. A site visit shall be arranged by the Contractor with the Architect, Owner, and Architect's signage consultant as required to spot exact location of signs.

C. Labels: No labels shall be affixed to any sign or directory. Required labeling (i.e., City or Underwriter's Laboratories, Inc.) shall be approved by the Architect prior to application of any label.

D. Existing Signs: All existing signs that are to be removed are the responsibility of the Contractor. The signage Subcontractor shall to patch, fill, and refinish existing surface to like new condition prior to installation of new signs. Coordinate this work with Architect and Contractor.

E. Quality Control: The Contractor shall be responsible for the quality of all materials and workmanship required for the execution of Work of this Section including the materials and workmanship of any firms or individuals who act as subcontractors or sub-subcontractors. The Contractor shall furnish subcontractors with complete and up-to-date Drawings, Specifications, sign schedules, etc.

F. Drawings and Specifications:

1. The specifications in this Section are general sign specifications. Some specifications herein may not apply to the current Work. Read carefully with the drawings and Sign Schedule.
2. The Drawings and Specifications are mutually dependent. In the event of any discrepancy or error, neither one rules over the other. Notify the Architect of any errors or discrepancies prior to fabrication or installation of signage.
3. Details shown on the Drawings shall be followed for exterior appearance. Contractor may change interior construction shown on these details to conform with shop practices.
4. Architect shall be notified of any discrepancies in the Drawings, Specifications, or sign schedule, in field dimensions or conditions and/or changes in construction details.
5 Copy, quantities and references shown on the sign schedule shall have precedence over Drawings.

G. Engineering: The Contractor shall furnish all structural engineering of signs, and shall provide footings and foundations where required for complete installation of the signs. Engineering of structural elements shall be performed by a California registered structural engineer employed by the Contractor; calculations signed and sealed by the structural engineer shall be included with the Shop Drawings.

H. Qualifications of Subcontractor: The Signage Subcontractor shall be able to demonstrate five (5) or more years of business activity in the architectural signing industry. Submit list and photos of projects completed and reference contact at each project.

I Location of Signs: The locations shown on Location Plan Drawings are for general information only. The Contractor shall arrange a meeting with Architect and the Architect's signage consultant at the site for the final location of sign elements. All signs are shall be located using numbered tags with correct item number.

J. Design Use: Architect's signage consultant hereby grants the Contractor the limited right to fabricate the designs herein for the sole purpose of completing this Contract. Contractor may not manufacture, reproduce, or exhibit these designs, or modify them for any other purpose, without written approval of the Architect's signage consultant.

K. Files Furnished to Contractor: This sign package was created in a Macintosh format. Digital files will be furnished to the Contractor in Adobe Illustrator 9 to open and work with the Drawings in this format. The Contractor shall to convert any and all files furnished to the Contractor to another format selected by Contractor, if the Contractor so wishes.

1.04 PRODUCT DELIVERY: Signs shall be properly stored on-site, if possible, and protected from the elements and vandalism.

1.05 SIGN SAMPLE WITH BID: As part of the bidding process the Contractor shall make one sample of a sign type to be determined for submittal with the bid, and be delivered to the Contractor with the final bid pricing. This sample will be evaluated as part of the bid review.

1.06 WARRANTY: Conform to Section 01790. Contractor and Signage Subcontractor shall warranty the signs against defects in materials and manufacturing for a period of 2 years. Written warranties for individual products used in the Work shall be delivered to the Owner. If during the warranty period, any defects or faulty materials are found, the Contractor shall immediately, upon notification by the Owner or Architect proceed at Contractor's own expense to replace and repair same, together with any damage to finishes, fixtures, equipment, and furnishings that may be damaged as a result of this defective equipment or workmanship.

PART 2 - PRODUCTS

2.01 PRODUCT MANUFACTURING: All cut and routing shall be executed in such a manner that all edges and corners of finished letter forms are true and clean. Letter forms with rounded positive or negative corners, nicked, cut or ragged edges, etc. are not acceptable. No radiused corners of letters will be accepted. All letter forms shall be so aligned as to maintain a base line parallel to the sign format. All margins must be maintained.

2.02 MATERIALS:

A. Aluminum Plate: For sign enclosures noted as aluminum plate provide alloy 5005 H-34 - mill finish panel flat aluminum, 1/8" thick minimum. Except as otherwise noted on Drawings, aluminum sign enclosures shall be of welded construction with joints ground, filled, and finished flush and smooth. Exposed aluminum shall be of alloy and finish suitable for ornamental or exterior work.

B. Aluminum Tubing: Tubing shall be heavy wall seamless extruded tubing, wall thickness and alloy as required to meet structural requirements. Surface shall be free of extrusion marks and other imperfections.

C. Adhesive: Silicone adhesive used for sign installation shall be manufactured by General Electric, Dow Corning, or equal. Polyfoam or contact adhesive tape, black, shall be used in conjunction with the silicone adhesives for installation of wall mounted signs, in thickness as required.

D. Foam Tape: Provide black polyurethane foam tape as manufactured by 3-M or equal, with contact adhesive backing. Cover entire back of sign.

E. Plexiglas or Acrylic Plastic: For sign surfaces, plastic shall be matte finish, P94, manufactured by Rohm & Haas Co., or equal. Clear acrylic shall be used as noted on the Drawings. Flame polish all edges. Plastic cements used to fabricate plastic parts shall be #4 cement manufactured by Industrial Polychemical, or equal. All plastics shall be uniform in color, translucence, and illumination, as supplied by the manufacturer. No uncemented plastic seams are allowed. Plexiglas edges shall be finished so that no saw, file, or sanding marks are visible.

F. Application of Vinyl Die Cut Letters: Vinyl die cut letters shall be die cut from Scotchcal film 3650 Series, or equal. Colors other than standard colors shall be achieved by the use of 3M 3900 series process colors applied to 3650 film or equal according to manufacturer's specifications. All copy shall be pre-spaced with 3M Series 2 application tape, prior to installation of sign.

G. Fasteners: All shall be rustproof and suitable for the product, location, and exposure.

2.03 PAINTING AND FINISHING: All paint and finish materials shall be the finest quality. All surfaces shall be properly prepared, primed, and painted following paint manufacturers recommendations. Final paint finishes shall be warrantied for two years against peeling, chipping, and crazing.

A. Paint Finish: All finishes noted as painted shall be powder coated or Matthews acrylic polyurethane coating, spray applied, or equal. All surfaces shall be primed as recommended by the paint manufacturer.

1. All finishes shall be eggshell finish unless otherwise noted on the Drawings and meet all ADA codes.
2 Sign background and copy colors shall match specified and approved Samples.
3 The Architect will furnish a color board to the Signage Subcontractor at start of the Work of this Section. It is the Signage Subcontractor's responsibility to match the paint and paint finish to the color board Samples and submit brush-off colors for approval prior to painting.
4. Clean all surfaces before applying paint or letters by removing all chalk, dust, grease, and oils.
5 Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint is of a uniform finish, color and appearance.
6 Clean up - during the process of the Work, remove from the project site daily all discarded paint materials, rubbish, cans, and rags.
7 Remove all crating and debris from the Site and leave premises in clean condition.
8. Upon completion of painting, clean or repaint all paint splattered surfaces. Remove splattered paint by proper methods of washing and scraping using care not to scratch or otherwise damage finished surfaces
9 Do not paint or apply letters over dirt, rust, scale, moisture, grease, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint surface.

B Painted Wall Graphics and Columns: The Signage Subcontractor shall coordinate with the Painting Subcontractor on the Work to ensure that the walls and columns are prepared and painted properly to accept painted graphics. Signage Subcontractor shall clean dust and dirt from walls and/or columns prior to painting.

1. Signage Subcontractor shall notify the Architect and Contractor of any problems with the surfaces before starting painting of the graphics. A test column or wall shall be painted to ensure adhesion of graphics paint to wall surface with appropriate masking.
2. Signage Subcontractor shall clean up and touch up paint problems or pulled up surface paint.

2.04 EVACUATION MAPS: Signage Subcontractor shall produce all digital camera ready artwork for all the evacuation maps for all buildings and locations as required. The Signage Subcontractor shall submit artwork for approval by the Architect prior to fabrication. Signage Subcontractor shall obtain all necessary code approvals from Fire Marshal prior to fabrication.

PART 3 - EXECUTION

3.01 SITE CONDITIONS: The Signage Subcontractor shall examine all surfaces on which sign work is to be applied, and conditions under which the signage work is to be performed, and shall notify the Contractor and Architect in writing of any conditions detrimental to the performance of the signage work. Do not proceed with signage work until unsatisfactory conditions are corrected and are acceptable to Signage Subcontractor. Starting signage work at the site by Signage Subcontractor will be construed as Signage Subcontractor's acceptance of the surfaces and conditions within the work area for warranty purposes.

3.02 INSTALLATION:

A Installation of signs shall follow the drawings and standards provided herein.
B. Protective coatings and identification numbers and stickers, and paper shall be removed at completion of the installation.
C Footings and supports for signs shall be installed prior to installation of paving whenever finished paving has not been already installed. Provide patching of existing paving materials to match adjacent paving.
D. Protect units from damage until final acceptance by the Owner. Repair or replace damaged units as directed by the Architect at no extra cost to the Owner..
E Corrections or replacement of damaged or rejected signs shall be completed no later than 2 weeks after notification of any problem unless otherwise requested differently by the Owner.
F Signage Subcontractor shall apply a carnuba wax based automotive type liquid polish on all signs for protection after complete installation.
G Signs shall be installed permanently, using concealed fasteners, vandal proof, which shall be specified on the Shop Drawings.
H. Installed signs shall be clean, properly aligned, level and true to line and dimensions, flush to surface unless otherwise specified, and free of excess visible adhesive glue if used, with no damage to the sign or surrounding surfaces, and other imperfections.
J Signage Subcontractor shall repair all damage to the signs or surrounding surfaces to the satisfaction of the Owner and Architect. Damaged signs shall be replaced with whole sound conforming signs.
J. Clean sign material using only cleaners and methods specified by the manufacturers.
K Installation of signs shall be carried out in a professional manner equal to the finest quality industry standards.
L. Install all signs plumb. All surfaces shall be free from distortion. No oil canning will be permitted, without exceptions.
M. Locate all signs per the Drawings and schedules.

3.03 CLEANING UP: Conform to Section 01740. Clean up and remove from the Owner's property all waste materials, debris, dirt, and surplus materials resulting from Work of this Section. Leave all areas where Work of this Section is performed in a clean and acceptable condition.

END OF SECTION

SECTION 10750

TELEPHONE SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide public use pay telephone panels, complete.

A. Related Work:

1. Empty conduits with pull ropes, and telephone outlet boxes.
2. Telephone instruments (NIC).
3. Concealed backing in walls.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit catalog data for telephone panels.

B. Samples: Submit Sample of exposed metal finish if requested by Architect.

PART 2 - PRODUCTS

2.01 TELEPHONE PANELS: Provide American Specialties, Inc. "Tellette #1452", equivalent by Phillips & Brooks/Gladwin, or equal. Exposed surfaces shall be of stainless steel with #4 satin texture finish.

PART 3 - EXECUTION

3.01 INSTALLATION: As indicated and according to manufacturer's instructions.

END OF SECTION

SECTION 10810

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section Provide toilet accessories, complete.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit showing installation details and required blocking or backing plate locations.

B. Samples: Submit such Samples as the Architect may request, which will be returned to the Contractor. Approved Samples may be installed in the Work.

PART 2 - PRODUCTS

2.01 MATERIALS: Accessories as scheduled on the Drawings, stainless steel products of Bobrick, Parker, or Bradley.

PART 3 - EXECUTION

3.01 INSTALLATION: Install all accessories square, plumb, and level. Securely anchor by mechanical means using only stainless steel fasteners. Conform to the rough-in and installation templates. Exact locations shall be as indicated or directed by the Architect.

END OF SECTION

SECTION 10990

MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide the miscellaneous specialties indicated and specified, complete.

A. Work Included:

1. Ornamental bollards.
2. Bicycle racks.
3. Building Rapid Entry System.
4. FRP wall panels for Janitor Closets
5. Dock bumpers.
6. Kalwall roof with anodized aluminum support framing at telephones.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings and Samples: Submit for various items as specified herein. Show materials, finish, characteristics, construction and fabrication details and procedures, layout and erection diagrams, methods of anchorage to building construction, templates for backing or anchorage, and other criteria.

B. Product Data: Submit catalog data for all standard manufactured items and as applicable to shop-fabricated or shop-assembled items.

PART 2 - PRODUCTS

2.01 MANUFACTURE: Use products of only one manufacturer throughout for each specialty item specified unless otherwise noted or approved.

2.02 ORNAMENTAL BOLLARDS: Precast of white concrete of 3,000 psi compressive strength, reinforced as noted, cast in smooth forms. Provide embedded steel anchors for chains and provide powder coated steel chains of approved color.

2.03 BICYCLE RACKS: Manufactured by Hess America, "Ceres" model, steel hot-dip galvanized and then given an exterior quality powder coat finish of designated color.

2.04 BUILDING RAPID ENTRY SYSTEM: Knox Box Series 3227, recessed, 7" x 7" wide with flange, with stainless steel finish, and fitted with UL listed tamper switches. Order directly from the City of Los Angeles Fire Department and pay all fees and charges. Order and install one additional "Alert Decal" for each additional entry to the building.

2.05 FRP Wall PANELS: For Janitor Closet wall finish, provide ""Fire-X Glasbord" by Kemlite Co., Inc., division of Crane, Joliet, IL, 800/435-0080. Moldings, fasteners, adhesives and sealants shall be supplied by the panel manufacturer. When tested according to ASTM E84, maximum 200 smoke developed, fuel contributed of 0, flame spread of 25 or less, each panel bearing UL label. Submit Samples. Install in accordance with manufacturer's instructions.

2.06 DOCK BUMPERS: Provide Kelley "L" Model dock bumpers. tire fabric clamped and bolted into galvanized steel frames, 4" thick by 10" width (height), and 36" lengths except where shorter lengths are required to suit field installation conditions. Provide across wall opening as indicated, installed according to manufacturer's instructions.

2.07 KALWALL ROOF ASSEMBLY: Under the Design-Build requirements of Section 01150, provide translucent fiberglass sandwich panel system for roof over telephone area, panels 2-3/4" thick and manufactured by Kalwall Corp., 800/258-9777. The translucent panels shall be supported within an anodized structural aluminum channel framework meeting code requirements for roof construction and conforming to Drawings and specifications prepared, signed, and sealed by a California registered structural engineer at the Contractor's expense. Submit complete Product Data and evidence the panel system meets all code requirements with respect to flame spread and smoke developed. The exterior panel faces shall have permanent glass erosion barrier. Colors of translucent panels shall be as selected by the Architect and a medley of colors may be required. Panels shall have a tested U-factor of 0.22 or better. Install support framing system and translucent panel system in accordance with Kalwall manufacturer instructions.

PART 3 - EXECUTION

3.01 INSTALLATION: Conform to approved submittals and various manufacturers' instructions.

END OF SECTION

SECTION 11014

WINDOW WASHING SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Under the "design-build" procedure (refer to Section 01150), provide a complete system for the washing of all exterior windows and maintenance of the building exterior. System shall be engineered and designed by Contractor to comply with all CAL-OSHA and Building Code requirements. System shall include and conform to the following as a minimum:

A. Work Included:

1. Portable davit sockets for typical locations
2. Top rotation two-piece davit arms with suspension trolleys for typical locations
3. Portable wire rope lowering guide channels for parapet protection.
4. Davit socket pedestals where shown on the Drawings and as required by system design.
5. Davit erection winches
6. System to be designed without proprietary platforms. Platforms shall be provided by the window washing company.
7. Base building shall provide secured hose bibbs at maximum 90" centers around roof perimeter for window washing use.
8. Base building shall provide waterproof electrical outlets at each window washing hose bibb with anchored eyebolt for use in securing power cord for window washing operators.
9. Davit dollies.

B. Related Work:

1. Any additional supporting steel such as beams, beam stiffeners, pedestal support plates, bracing members, etc., required to properly support the socket pedestals will be provided under other Sections.
2. 220 volt, single phase, 30A power, 60 hertz outlets.
3. Anchor eyebolts, capable of sustaining a 100 pound load, adjacent to each electrical outlet, for attachment of the electric cord strain relief grip.
4. Hose bibbs.
5. Waterproofing, flashing, pitch pans, etc.
6. Runway surface to allow the equipment to roll along the roof.

C. Design Requirements:

1. All equipment from which the rental self-powered work platform is suspended shall be designed to support the working load with a safety factor of not less than 4.
2. All davit arms shall rotate 360 degrees while carrying the full design load.
3. All davit arms shall be designed to allow for roof rigging of the suspended equipment.
4. The Structural Engineer of Record shall verify all connections of the equipment to the structure.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit clearly illustrating all Work of this Section including all the work positions of the equipment, details of the equipment, load reactions from equipment to the building structure, and location and method of attachment of all equipment to the building structure.

B. Structural Calculations: Submit calculations covering all Work of this Section, prepared by a registered professional civil, structural, or mechanical engineer registered in the State of California.

C. Operation and Maintenance Manuals: Prepare and submit operation and maintenance manuals in accordance with Section 01770. Include printed operation instructions, maintenance and safety checklist procedures, and parts catalog.

1.03 QUALITY ASSURANCE:

A. Manufacturer Qualifications: The equipment manufacture shall have been in this trade for at least 5 years.

B. Codes: The equipment shall be manufactured in strict compliance with the following and all other pertaining laws, codes, regulations, regulatory requirements, and governing Building Code.

1. Title 8 CCR, California General Industrial Safety Orders, Articles 5 and 6.
2. ANSI A120.1-1992, Safety Requirements for Powered Platforms for Exterior Building Maintenance.
3. 29 Code of Federal Regulations dated July 1990, Section 1910.66, Sub Part F.
4. ANSI A39.1, Safety Requirements for Window Cleaning.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER: One of the listed maintenance equipment manufacturers following, or a substitution approved in accordance with Section 01630.

A. Manufacturer: Subject to compliance with THE requirements specified in Paragraph 2.01B below, manufacturers offering products which may be incorporated in the Work include, but are not limited to:

1. Skymaster, Inc.
   17837 Maclaren Street
   City of Industry, CA 91744
   (626) 913-8125 FAX (626) 336-2755

2. Spider Staging Company
   23500 64th Avenue South
   Kent, WA 98032
   (206) 575-6445 FAX (206) 575-6240

3. Tractel Ltd., Swing Stage Division
   315 Cloverleaf Dr., Unit U
   Baldwin Park, CA 91706
   (626) 937-6727 FAX (626) 937-6730

B. Substitution: The specified system may be manufactured by another manufacturer as a proposed substitution (refer to Section 01630), approved by the Owner in an appropriate Modification but the proposed substitute manufacturer must have a minimum of five years of experience in the "industry" with specific experience in the successful design, fabrication, and installation of like equipment and shall have a minimum of five years of incorporation under its present name, possessing a valid California Contractor's License.

2.02 MATERIALS:

A. Steel Shapes, Bars, Plates -- ASTM A36.
B. Steel Tubing -- ASTM A500, Grade B, or ASTM A519.
C. Steel Pipe -- ASTM A53, Grade B.
D. Aluminum -- Alloy 6061-T6.

2.03 SOCKET PEDESTALS: Socket pedestals shall be designed to support the suspended working load with a safety factor of 4 to 1.

A. The pedestals shall be a welded construction using ASTM A36 steel plate and ASTM A53 Grade B pipe. All welds shall be made by certified welders in accordance with Structural Welding Code - Steel, AWS D1.1-96.
B. The pedestals shall be designed to be welded to the building structural steel per the approved Shop Drawings.
C. Top of the pedestal shall have a plate which will accept the portable davit socket and rigidly hold it in place.
D. After fabrication, pedestals shall have a hot-dip galvanized finish conforming to ASTM A123.

2.04 REGULAR PORTABLE DAVIT SOCKETS: Portable davit shall be designed to support the suspended working load with a safety factor of 4 to 1.

A. The socket shall be welded construction using ASTM A36 steel shapes, plates, and bars, and ASTM A53 Grade B pipe.
B. The pedestals shall be a welded construction using ASTM A36 steel plate and ASTM A53 Grade B pipe. All welds shall be made by certified welders in accordance with Structural Welding Code - Steel, AWS D1.1-96.
C. The regular portable sockets shall be designed to mount onto the pedestal engaging plate.
D. Two 8" diameter semi-pneumatic wheels shall be provided on the socket.
E. Handles shall be provided on the sockets to allow them to be rolled around the roof.
F. A 1" round U-bar with an ID of 2" shall be welded to the socket frames for the safety line attachment.
G. Socket pipe shall hinge down to allow the davit arm to be easily installed into socket pipe.
H. Socket pipe shall be locked in position when the davit arm is in a fully vertical position.
I. Sockets shall be equipped with a davit arm withdrawal prevention bracket.
J. After fabrication, davit sockets shall have a hot-dip galvanized finish conforming to ASTM A123.

2.05 ROTATION DAVIT ARMS: Shall be designed to support suspended working load with a safety factor of 4 to 1.

A. The davit arms shall be load tested and certified at 4 times the rated working load prior to shipping from the manufacturer's shop.
B. Each davit arm shall have the required OSHA / ANSI nameplate attached.
C. Davit arm shall be designed to rotate 360 degrees.
D. A place shall be provided on the trolley for all the electric cord strain relief grip to be attached.
E. The davit arm shall be aluminum left in a mill finish.

2.06 DAVIT DOLLY: Provide davit dollies with two 8" diameter semi-pneumatic wheels to transport the davit arm sections to the various work locations.

2.07 REGULAR AND ELEVATED HINGING DAVIT SOCKETS: Shall be designed to support the working load with a safety factor of 4 to 1.

A. The davit sockets shall be a welded construction using ASTM A36 steel plate and ASTM A53 Grade B pipe. All welds shall be made by certified welders in accordance with Structural Welding Code - Steel, AWS D1.1-96.
B. The elevated davit sockets shall be designed to be welded to the building structural steel per the approved Shop Drawings.
C. A 1" round U-bar with an ID of 2" shall be welded to the socket frames for the safety line attachment.
D. Socket pipe shall hinge down to allow the davit arm to be easily installed into socket pipe.
E. Socket pipe shall be locked in position when the davit arm is in a fully vertical position.
F. Sockets shall be designed to accept a portable davit erection winch.

G. Sockets shall be equipped with a davit arm withdrawal prevention bracket.
H. Where required, the davit socket shall have a stanchion pipe on the bottom to elevate it at high parapet wall conditions.
I. After fabrication, davit sockets shall have a hot-dip galvanized finish conforming to ASTM A123.

PART 3 - EXECUTION

3.01 EXAMINATION: Refer to Section 01710 and report to Architect in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

3.02 HOISTING: The hoisting of all material provided by the equipment manufacturer under this Section shall be performed by the General Contractor.

3.03 INSTALLATION: All components shall be installed in accordance with the approved Shop Drawings in sufficient time to avoid delays to the construction process. All exterior building maintenance equipment shall be secured in place as shown on Drawings and as herein specified by rigid approved methods.

END OF SECTION

SECTION 11150

PARKING CONTROL EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Under the "design-build" procedure (refer to Section 01150), provide parking control and related equipment as indicated, specified, and required.

A. Work Included:

1. Design submittals.
2. DKS-1601 barrier gate operator.
3. Parking attendant's booth.
4. Buried loop detectors in concrete slabs as required.
5. Cable beam barrier units.
6. Painting for Work of this Section.

B. Related Work:

1. Electrical power service and final connections.
2. Empty conduit for control wiring.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings and Product Data: Submit covering all the Work of this Section. Include wiring diagrams, dimensioned layouts for required conduit, and attendant booth construction and installation.

B. Samples: Submit Samples of required paint finishes corresponding to Architect's color instructions.

1.03 QUALITY ASSURANCE: Work of this Section shall be installed by each equipment manufacturer or by an installer approved by each equipment manufacturer.

1.04 PROJECT CONDITIONS: Verify dimensions at the site before submitting Shop Drawings.

1.05 WARRANTY: Conform to Section 01790. Warranty all Work of this Section for one year.

PART 2 - PRODUCTS

2.01 BARRIER GATES: Model DKS-1601 Barrier Gates manufactured by Deck King, Inc., Inglewood, CA, and installed where shown. Gates are not designed for motorcycle or pedestrian traffic. The barrier gates shall meet or exceed the following specifications.

A. Operational Overview: The gate control circuitry shall be contained on a printed circuit board unit that shall be housed in a pluggable control box with electronic limit settings. A switch to raise, lower, and select automatic functioning of the gate shall be provided on the control box.

1. Optical Scan: One way direction traffic with gate opening initiated by key card control device or by Security Officer. The gate shall be closed, where required, by a vehicle detector signaling the departure of a vehicle with dry contact operation. A count pulse shall be available to operate counting devices as each vehicle is recognized.

2. Free Direction Only: One way free direction with the gate opening initiated by a vehicle detector. This operational mode shall include automatic gate closure if a vehicle backs away from the gate opening loop.

A vehicle detector signaling departure of a vehicle from the closing loop with dry contact operation shall close the gate. A count pulse shall be available to operate counting devices as each vehicle is recognized.

B. Features: Shall include the following:

1. Extra Sensory: This feature shall ensure that the gate arm will reverse direction and return to UP position if it strikes an object during its descent. The gate arm will remain up until automatically reset. The reset means shall be switch selectable between a time period of 5 or 10 seconds, and a close signal. This function shall be initiated by a mechanical sensing action that must be contained in the gate housing. The external mounting of tubes, wiring, and electrical devices on the gate arm will not be accepted.

2. Auto Stop: Gate arm shall immediately stop its downward travel if the gate closing loop detector senses the presence of a vehicle, and resume its downward travel after vehicle leaves the closing loop.

3. Rotating Upper Mechanism: Gate housing shall be configured to allow for a 90 degree rotation of upper mechanism in relationship to the pedestal base. This feature allows the access door to be placed in any one of four positions independent of the gate arm.

C. Replacement Footprint: The gate housing shall be configured to allow for direct replacement of other brand gates without the need to change the existing mounting holes or bolt layout.

D. Detailed Specifications:

1. Gate Cabinet:
   a. Heavy gauge steel welded construction with heavy-duty polyethylene cover.
   b. Dimensions:
      (1) Height: 38".
      (2) Width: 15".
      (3) Depth: 15".
2. Weight: Less than 166 pounds (75 kg).
3. Finish: White paint on the pedestal base
4. Housing shall contain additional control apparatus such as:
   a. Auto-close timer 1-23 seconds.
   b. Gate tracker.
   c. Auto sequence.
   d. Electronic limits.
   e. Loop detector.
5. Service Access:
   a. Removable cover over drive mechanism for 360 degrees access.
   b. Removable door for access to electrical connections and control box.
6. Safety labeled for increased awareness.

E. Gate Arm:

1. Height: 34" (86 cm) in DOWN position.
2. Maximum arm length - wood: 14 feet.
3. Arm shall be attached to shaft by a clamp device for easy replacement or reinsertion of the usable length following fracture.

F. Motor Characteristics:

1. Horsepower: 1/3, single phase.
2. Worm gear in oil bath (40:1 primary reduction).
3. Speed: 90 degrees - 1/5 seconds.

4. Fail secure.
5. Amperes: 5.4 A.
6. Integrated internal heater/fan.

G. Electrical: Gate operation shall be controlled by microcontroller technology contained on a solid state PCB. Low voltage DC circuits shall be used to provide positive control. AC control circuits will not be acceptable. Electrical controls shall be completely compatible with electronic revenue control systems and access control accessories. The gate shall contain an extra set of dry contacts to indicate gate status for use with auxiliary systems. If used with card access systems the auxiliary contact shall be used to allow card operation when gate is in the down position or in its down cycle. Plug-in, printed circuit modules shall be incorporated for low voltage power.

1. Input voltages available:
   a. 115 VAC, 60 Hz @5.4 A.
   b. 230 VAC, 60 Hz @ 2.7 A.
   c. 460 VAC, 60 Hz @1.4 A.

H. Control Panel:

1. Plug-in installation.
2. Trouble free motor control.
3. ON/OFF main power and logic circuit breakers.
4. Manual UP/NORMAL/DOWN switch.

I. Heater/Fan: Thermostatically controlled for operation in adverse weather conditions.

J Environment:

1. Temperature: 10 degrees F through 140 degrees F (-12 degrees C through 62 degrees C).

2.02 ATTENDANT'S BOOTH: Booth shall be ADA compliant, similar and equal to B.I.G. "Deluxe Steel" Model DS480B, modified as required to size and exterior wall profile as shown, sliding doors both sides at car lanes and fixed glazing with butted glass corners at ends of the booth, all glass fully tempered, with separate air conditioning and heating system, and parking control system equipment integrated into the booth interior. Booth shall be manufacturer's standard model modified as required to accommodate the installed parking control equipment and communications equipment, complete with interior and exterior lighting. Finish colors shall be as designated by the Architect.

2.03 CABLE BEAM BARRIERS: Barriers shall be as manufactured by Delta Scientific Corp., crash rated Model TT212, or equal, designed to stop a vehicle weighing 10,000 pounds traveling at 25 MPH. Arm lengths shall be as indicated; verify before ordering. Barriers shall be operated manually. Include keyed lock for each barrier; obtain lock cylinder from hardware supplier under Section 08710 and on same keyway as building keyway. Units shall include protection against exterior environmental conditions. Height of the beams above pavement shall be as indicated unless otherwise ordered by Owner or Architect.

A. Fire Department Access: Include provisions for Fire Department vehicle access without delay access system as satisfactory to governing Fire Marshal; fully detail in submittals.

C. Mounting: Barriers shall be mounted on concrete bases as indicated. Fully detail in Shop Drawings.

D. Submittal: Submit Shop Drawings for entire system.

2.04 SHOP PAINTING: Equipment items shall have manufacturer's standard exterior quality baked enamel finish. Other metal surfaces, except guide track interior friction surfaces and drive mechanisms, shall be shop or

field painted with exterior industrial enamel paint finish as specified in Section 09900. Custom colors are required.

PART 3 - EXECUTION

3.01 INSTALLATION AND TESTING: By each equipment manufacturer or manufacturer's approved installer in accordance with approved submittals. Test installed system for correct operation and perform adjusting and corrections as required. Touch-up and repair all damaged paint finish.

3.02 DEMONSTRATION: At a time designated by the Owner, each equipment manufacturer's factory representative shall instruct the Owner's maintenance personnel in correct continuing maintenance procedures as well as trouble shooting procedures to effect prompt field fixes of malfunctioning equipment.

END OF SECTION

SECTION 13854

SUBSURFACE METHANE GAS MITIGATION

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide subsurface methane gas mitigation systems as indicated and specified, complete and operable.

A. Work Includes:

1. Construct building sub-slab gas membranes and barrier systems, sub-slab gas venting systems, and vent risers.
2. Provide self-contained gas monitoring systems.

B. Related Sections:

1. Section 02235: Clearing and Grubbing
2. Section 02300: Earthwork
3. Section 02313: Earthwork for Utilities
4. Division 3: Concrete
5. Division 15: Mechanical
6. Division 16: Electrical -- NOTE: Division 16 shall provide all conduit for wiring described and specified in this Section.

1.02 SYSTEM DESCRIPTION:

A. The subsurface gas mitigation systems shall be constructed as shown on the GP Drawings and in accordance with the requirements specified herein to provide building-wide controls of subsurface gases (i.e., methane) that are naturally occurring from the petroleum deposits underlying the Project site. The systems to be provided vary depending on facility use and can be generally described as follows.

B. The New Office Building shall have a system comprised of the following:

1. Sensor devices and monitoring controls located in Parking Areas P3 and P4 and connected to the Methane Gas Monitoring Panel in a Storage Room on Parking Area P4. Sensors shall be equipped to detect methane at prescribed trigger levels. If trigger levels of methane are exceeded, controls will send signals to simultaneously increase HVAC rate of air exchange inside Parking Areas and Visual and Audio Alarm Panel installed in the Security/Administration Office (Room No.130) will signal status of methane gas levels. The status of methane gas levels will include Warning Level calibrated to 10% and 19% of the LEL, and an Alarm Level calibrated to 20% and above the LEL.

2. A network of slotted piping beneath each building slab and embedded in a permeable sand layer that serves to collect the soil-gas and convey it through solid pipes to solid-pipe vent risers located outside the building for discharge at locations away from receptors and building openings;

3. A network of solid pipe connected to subgrade water drains and water sumps at base of building's foundation, as well as the top of building foundation (MIRADRAIN) that serves to collect soil-gas and convey the gas to vent risers;

4. A very low permeability membrane (i.e., high density polyethylene - HDPE) installed continuously beneath floor slabs and outside sub-grade vertical wall systems;

5. Trench dams installed in each utility trench that extends beneath and/or alongside new building. These trench dams serve to prevent horizontal methane gas migration along porous trench backfill from accumulating against the building envelope; and

6. Seals installed in and/or around each subgrade penetration of building envelope/foundation (i.e., floor slabs, column footings, retaining walls, shear walls, etc.).

1.03 SUBMITTALS: Conform to Section 01330 for submittal procedures.

A. Imported Sand and Gravel: A Geotechnical (Soils) Engineer, retained by the Owner as consultant to the Owner (refer to Section 01450) shall obtain initial product samples for testing in accordance with the terms of Sections 02300 and 02313.

B. Piping Materials: The Contractor shall obtain from the supplier and furnish to the Owner technical material that verifies the PVC, ABS, stainless steel, and iron pipe meet the material requirements specified in this Section.

C. Geotextile and HDPE Membrane and Pre-fabricated Membrane Boots: A gas mitigation Engineer, retained by Owner as an Owner Consultant, shall obtain certificates of compliance from the manufacturer and/or supplier of these materials certifying: that the material is free from defects; is of the required thickness, strength, durability, and dimensional stability; that the required factory tests have been performed: and that the materials meet the specifications listed in sub-sections 2.08 and 2.09 of this Section.

D. Samples of HDPE membrane proposed for the project.

E. Manufacturer's recommendations for the membrane field seaming and repair.

F. Gas Detection Sensors, Electrical Controls and Display Units: A gas mitigation Engineer, retained by the Owner as a Owner Consultant, shall obtain from the manufacturer/supplier Shop Drawings, calibration data, and certificates of compliance for each of these units verifying that each meets the requirements of Article 2.15 of this Section.

G. Sealants: A gas mitigation Engineer, retained by the Owner as an Owner Consultant, shall obtain from the manufacturer or supplier of each sealant material a written description of the material contents and performance data for verification that each meets the requirements of Article 2.13 of this Section.

H. Trench Dam Materials: If bentonite/cement slurry is used for trench dams, the Contractor shall provide mix design data and product data for the bentonite and cement to the gas mitigation Engineer for verification of compliance with Article 2.17 and Paragraph 3.09.Q of this Section.

I. Submittals:

1. Shop Drawings, layout diagrams, catalog data and literature, instructions, directions, warranties, test reports, and information in sufficient detail to show complete compliance with all specified requirements, shall be submitted by Contractor to the Architect and Engineer in such number of copies as will allow the Engineer to retain two copies of each submittal. The Architect's and/or Engineer's notations of action that have been taken will be noted on the returned copies.

2. If, after reviewing a submittal for an item, the Engineer finds that such submittal is unacceptable, the Contractor shall make the necessary correction and resubmit the revised Shop Drawings for such item. The Engineer will review the first submittal for an item without charge to the Contractor. However, if the Engineer finds the first submittal to be unacceptable, the Contractor shall bear the full cost of all subsequent reviews by the Engineer, and such costs will be deducted by the Owner from any fees due to the Contractor. The Engineer's review of Shop Drawings shall in no way release the Contractor from its responsibility for the proper fulfillment of requirements of this Section, nor for fulfilling the purpose of the installation, nor from its liability to replace the same, should it prove defective or fail to meet specified requirements.

1.04 QUALITY ASSURANCE:

A. Compliance with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition, except as modified.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01450.

C. Certification of Leak/Smoke Testing of HDPE Membrane: The gas mitigation Engineer shall observe all leak testing and prepare written certification that the testing was performed in accordance with procedures of Paragraph 3.08.C of this Section, and that the area passed/failed the testing.

D. Photographs shall be taken of representative areas of all sub-surface gas mitigation systems and the locations of each photograph recorded by the gas mitigation Engineer on a log for documentation.

1.05 PROJECT CONDITIONS:

A. Information on Drawings or in soils reports does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A copy of the foundation investigation and soils reports is available for examination at the Architect's office during regular office hours of the Architect.

C. The work described in this Section is for mitigation of potential subsurface soil-gas conditions involving methane. Copies of the site investigation report and feasibility studies and/or the remedial action plans that describe these conditions are available for examination at the Architect's or Owner's office during regular office hours.

PART 2 - PRODUCTS

2.01 GENERAL: All materials shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused, and shall conform to the following requirements.

2.02 ADS PIPES (HDPE CORRUGATED PIPE): ADS single wall pipes shall be factory slotted and shall comply with AASHTO designation M252. Pipe and fitting shall be made from virgin PE compounds that conform to the requirements of cell 324420C as defined and described in ASTM D3350.

2.03 BLACK STEEL PIPES: Carbon steel pipes and fittings: Pipes and fittings for the vent pipe. Risers shall be carbon steel (CS) API 5l grade B, ASTM A53 grade B, or ASTM B106, grade B.

2.04 PVC PIPES AND FITTINGS: PVC pipes and fittings shall be Schedule 80, conforming to the requirements of ASTM D1785, D2464, and D2466, and shall have been approved by the National Sanitation Foundation (NSF).

2.05 PVC COCK VALVES: Gas sampling valves shall be 1/4-inch PVC cock valve. Valve seat and seal shall be EPDM. Valves shall have a 1/4-inch MPT one end, and hose connection on the other end, and shall be manufactured by Chemtrol, Asahi/America, or approved equal.

2.06 SAND FOR SUB-SLAB SYSTEMS: Sand to be used for sub-slab systems shall be coarse-washed concrete sand, free of deleterious amounts of organic material, mica, loam, clay and other substances not suitable for the intended purpose with permeability of 1 x 10-1 cm/sec, with a gradation conforming to **TABLE 1** at the end of this Section.

2.07 GRAVEL: Shall be clean, river run or unbroken round gravel of 3/4" minimum size. Material shall meet ASTM C33 paragraph 9.1 requirements, with gradation conforming to **TABLE 2** at the end of this Section.

2.08 FABRIC: Geotextile fabric for protection of HDPE membrane shall be minimum 10 oz/sq.yd. non-woven, needle-punched polypropylene fabric, Fibertex or equal, of uniform thickness and surface texture and conforming to the properties in **TABLE 3** at the end of this Section.

2.09 HDPE MEMBRANE: HDPE membrane shall be oil-resistant, 60-mil or 100-mil HDPE conforming to the properties as given in the **TABLES** at the end of this Section and as manufactured by Gundle Lining System Inc., Houston, Texas or approved equivalent. The methane gas transmission rate for the membrane shall be less than 40 cc/sq m-24 hours atm. The membrane shall be chemically compatible with the environment in which it will be used.

2.10 PREFABRICATED MEMBRANE BOOT: The prefabricated membrane boot shall be at least 60-mil HDPE membrane or approved equivalent membrane material, and shall be manufactured by the same manufacturer as the membrane.

2.11 CLAMPS: Pipe clamps shall be stainless steel clamps, Mission Clay Products No. 37, or equal.

2.12 BUTYL RUBBER TAPE : Butyl rubber tape shall be GS No. 4 as manufactured by General Sealants, or approved equal.

2.13 SEALANT: Oil-resistant polyurethane sealant shall be FP 1212 Pourable Joint Sealant, as distributed by General Sealant, or approved equal.

2.14 PIPE JOINTING: When indicated on the Drawings, joints shall be flush threaded joints screwed with Teflon thread lubricant. Threaded joints shall be prepared in accordance with the joint manufacturer's printed instructions.

A. Except where noted, PVC pipe shall be joined by solvent cementing.
B. Joining of pipes shall be in accordance with the manufacturer's recommendations.
C. All flexible connectors below grade (buried) shall be Kanaflex Series 101-P5, or approved equal.

2.15 METHANE GAS MONITORING SYSTEMS: The systems provided for monitoring methane from the building's P3 and P4 parking areas shall be capable of detecting methane below trigger action levels of 5000-ppmv and 10,000-ppmv, respectively. These systems shall be capable of continuously monitoring methane in air within the parking areas without being affected by the fumes from automobiles. Methane Gas Monitoring Systems manufactured by General Monitors, Inc. as specified herein or equivalent (manufacturer's specifications on alternative units must be reviewed and approved by the methane gas Engineer prior to substitution) shall be installed in locations shown on the GP Drawings.

A. This gas monitoring system is designed to passively detect the presence of Combustible Gas (Methane).

B. The system shall be designed and constructed to minimize the risk to the Project building and its occupants of exposure to dangerously high concentrations of methane gas. Inherent in the system design shall be internal, continuous self-diagnostics to ensure the system is operating properly.

C. System Overview:

1. Methane Gas Monitoring System: Methane Gas Sensor Monitoring Panel shall be designed to detect combustible gas concentrations in remote areas. The system shall be operated on 24-VDC power supply and a battery backup system. The system panel shall be contained in NEMA-12 enclosure designed for wall mount and provided with a key lockable windowed door. The minimum requirement of the system shall consist of the following main components:

a. Combustible Gas Sensor Assembly: Combustible gas sensors shall be a low temperature, catalytic coated, continuous diffusion type, with dual matched sensor beads. A Wheatstone bridge circuit shall provide compensation for ambient temperature, pressure and humidity variations. The sensor shall be poison resistant. The sensor shall be capable of measuring the combustible gas concentration in a range of 0 to 100 percent lower explosive level (% LEL). The sensor shall have a 6-second time constant when exposed to 50% LEL of Methane Gas. The sensor shall have zero drift of less than 5 percent of full scale per year. The sensor must be approved by Canadian Standard Association (CSA). Sensor assembly shall be contained in an explosion proof housing. The sensor assembly shall be capable of operating in Class 1, Division 1, Group B, C and D Hazardous Classified locations. The sensor shall be general purpose, poison assistant, aluminum body. The sensor shall be Model no.10001-1R manufactured by General Monitors, Inc., or approved equal.

b. Combustible Gas Controller Module: Shall be able to continuously monitoring combustible gas concentrations in four (4) remote locations. The Controller shall consist of four (4) remote sensing assemblies and a solid state controller. The Controller shall consist of four (4) independent channels. Each channel shall have its own control circuitry. The Controller shall feature a digital display of gas concentrations in % LEL (0-99% lower explosive limit) for each channel. Calibration of each channel shall be done independently with alarm relays disabled while in this mode. The Controller shall have a variety of relay options, such as normally energized or de-energized high and low alarms and latching or non-latching high and low alarms. The malfunction relay circuitry shall normally be energized. These relays shall be either discrete for each channel or common to all channels. Also, the Controller shall be able to provide an analog output for each combustible channel. The Controller Module must be approved by the Canadian Standards Association (CSA) and must meet the CSA performance standard for combustible gas detection. The Combustible Gas Controller Module shall be Four Channel Combustible Gas Monitor Model 610 manufactured by General Monitors, Inc., or approved equal.

c. Enclosure: The Enclosure shall be wall mounted, NEMA-12, key lockable windowed door with mounting back panel.

2. Methane Gas Alarm: Methane Gas Alarm Panel shall be contained in NEMA-12 wall mount enclosure with mounting back panel, approximately dimension of 12"h x 12"w x 8"d. Provide components and wiring as shown on the drawings. Horn mounted in front of the Methane Gas Alarm Panel shall be operated on 120-VAC. Horn shall be Vibratone Horn, Model 350 manufactured by Federal Signal or equivalent approved by the gas mitigation Engineer.

3. Battery Backup: A battery backup system shall have capacity to provide emergency power to the Gas Monitoring System Controller Modules and Sensor Assemblies in the event of power outage for a period of at least 5 minutes during transferring power from normal grid-power to emergency generator power. The battery backup shall have minimum of 5 Amperes-Hours. The 24-VDC power from the battery backup shall be automatically accessed by the controller if 120-VAC power input drops below 90-VAC. when AC -power returns above 90-VAC, the battery backup system shall return to standby status and the battery shall be recharged. The system shall consist of a 24-VDC battery, converter, and a dual mode charging circuit. The two charging modes shall be a float mode and a fast charging mode. The 24-VDC circuits providing power to the Sensor Monitoring Panel shall be equipped with 15 Amperes 24-VDC fuses as shown on the Drawings.

4. Wiring: All panels shall be provided with field terminal strip and shall be completely pre-wired, tested, and inspected by the manufacturer.

2.16 CONDUIT PROTECTION: All underground conduits penetrating the building envelope, including: high and low-voltage electrical, cable television, telephone, etc., shall be provided with a Crouse Hinds Conduit Seal, EYS 1 Series, or equivalent, approximately 18-inches above the floor slab or 18-inches inside the vertical shear wall. All electrical conduits entering main switchboards on the building exteriors and/or entering electrical panels on the building interiors shall also be provided with the EYS seal (Refer to GP Drawings and Paragraphs 3.09.O and P of this Section).

2.17 TRENCH DAM MATERIAL: Cement/bentonite slurry used for trench dams shall be a mixture of 26% Type II Cement, 8% powdered bentonite, and 66% water by weight.

PART 3 - EXECUTION

3.01 SITE PREPARATION: Clear the Project site as required in Section 02235.

3.02 PROTECTION: Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, OSHA regulations.

A. Protect adjacent existing improvements including landscaping against damage.
B. Shore, crib, or lag excavations and earthen banks as necessary to prevent caving-in, erosion or gullying of sides.
C. Divert or de-water excavations until concrete or asphalt is placed, forms are removed, and backfilling is complete.
D. Protect and monitor all subsurface excavations, confined spaces, and other voids in communication with soil for presence of methane gas, ventilate areas prone to gas accumulation, and safely divert soil-gas accumulating in vent risers until complete.

3.03 SHORING: Provide shoring as necessary to properly and safely support earth sides of excavations, curbs, sidewalks, gutter, drives and stairs, against movement and collapse. Shoring shall meet the requirements of Section 02250.

3.04 EXCAVATION:

A. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.

B. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

3.05 IMPORT/EXPORT OF MATERIALS: Provide fill materials as specified in Part 2 - Products of this Section and Sections 02300, 02313, and 01450. In addition to the geotechnical sampling and testing described in Section 02300, all import and export materials shall be sampled and tested for chemical constituents in accordance with Section 01450.

3.06 BACKFILLING: Backfilling shall meet requirements of Section 02300. Pipe trenches shall be backfilled as required by Section 02313. Dispersion layer sand and "buffer zone" soil shall be placed and compacted in accordance with the requirements of Section 02313.

3.07 COMPACTING: Compact fill and backfill material in accordance with the applicable requirements of Sections 01450, 02300, and 02313.

3.08 INSPECTION AND TESTING: The gas mitigation Engineer shall be notified two at least (2) working days in advance of all field tests on any component of the gas mitigation system. To ensure there are no un-bonded seams, all field seams shall be tested by the Contractor in the presence of the gas mitigation Engineer by either electric spark testing (Holiday Test) or pressurized air or vacuum box testing. The gas mitigation Engineer shall have the right to reject any field seam because of poor workmanship, defective welds, or insufficient overlap. Any field seams rejected for these reasons shall be immediately repaired and/or replaced by Contractor to the satisfaction of the gas mitigation Engineer. The gas membrane shall also be smoke tested as specified prior to placement of sand layer and again prior to the placement of concrete or shotcrete. All leaks identified during smoke testing shall be immediately repaired to the satisfaction of the gas mitigation Engineer.

A. The HDPE membrane shall be Factory-tested; one sample per roll as per respective ASTM designation in Article 2.11 of this Section, and test results submitted by Contractor to the gas mitigation Engineer. Certificates of compliance shall be provided for each roll and include the following parameters:

1. Thickness
2. Minimum tensile properties
3. Tear Resistance
4. Low temperature impact
5. Dimensional stability
6. Resistance to soil burial
7. Factory bonded seam strength parameters shall comply with the values given in Article 2.09 of this Section and "Standard No. 54, Flexible Membrane Liner" by the National Sanitation Foundation.

B. Smoke Testing Procedures: The gas mitigation Engineer shall be notified at least two (2) working days in advance of any smoke tests. All gas membranes shall be "smoke tested" in accordance with the following protocol and certified "gas tight" by the gas mitigation Engineer prior to being covered by the Contractor:

1. The gas membrane shall be visually inspected, first by the Contractor then by the gas mitigation Engineer. Any apparent deficiencies and/or installation problems shall be corrected prior to Smoke Testing.

2. The date, time, building location or component identification, temperature, humidity, barometric pressure, wind speed and direction, and cloud cover shall be recorded by the gas mitigation Engineer on the Smoke Testing Inspection Form. The ambient air temperature at the time of testing should be in excess of 25°F and the wind speed at ground level should be 10 mph or less. [Note: Visual identification of leaks becomes more difficult with increasing wind speed].

3. Assemble/connect smoke testing system to vent riser (Alternative A) or configure smoke testing system to inject smoke beneath membrane through a temporary gas tight boot for sleeve attached to the membrane (Alternative B). Only inert, non-toxic smoke shall be utilized for the membrane Smoke Test.

4. Activate smoke generator/blower system at nominal 150 cfm to 450 cfm flow rate and 2-inch water column minimum duct pressure with vent riser outlet(s) uncapped. [Note: Minimum 2-inch water column duct pressure should be measured at or near blower outlet.] Continue to purge system for a minimum of 60-seconds after smoke begins to emerge from vent outlet(s).

5. Cap vent outlet(s). Adjust the smoke generator/blower control valve to maintain 1-inch to 2-inch water column over-pressure in vent piping system (Alternative A only). Blower/Smoke Generator system shall be capable of sufficient pressure and flow which may induce a slight (i.e., about 1/4 inch) lifting of membrane. Monitor membrane for lifting and immediately reduce pressure/flow rate if excessive lifting occurs.

6. Confirm adequate flow of smoke from the injecting locations. Low rate of smoke flow may be indicative of poor communication between vent piping sand/gravel at base of membrane for Alternative A (i.e., dirt placed above sand backfill). If low rate of smoke flow from coupon sampling location(s) occurs, use Alternative B described under Item #3 above for smoke injection. Connect smoke generator to injection boot and continue with smoke injection. [Note: At least localized continuity of the sand or gravel between the vent lines and base of the membrane should be confirmed prior to membrane installation.]

7. Maintain operation of smoke generator/blower system for at least 15-minutes following purging of membrane. Thoroughly inspect the entire membrane surface. Use fluorescent orange/yellow paint to mark/label any leak locations. Mark/label all leak locations on the floor plan, which is to be included with the Smoke Testing Inspection Form.

8. Repair leak locations marked in Step #7.

9. Repeat Step #'s 7 and 8, as necessary, to confirm integrity of membrane.

10. Prepare Smoke Testing Inspection Form. Notes shall include date, building location and/or component tested, name of gas mitigation Engineer, name of person/firm performing the test, number of leaks identified, distribution of leaks identified (i.e., punctures, tears, pin-holes or thin sections, seam leaks, boot leaks, etc.), and building floor plan with leak locations, coupon locations, and test perforation locations. The Inspection Form shall be signed and stamped by the gas mitigation Engineer/inspector.

11. Install a permanent weatherproof tag on front-most vent riser confirming completion of the smoke testing and approval of membrane. Tag shall include:

"Smoke Tested OK"
<Building description/location tested>
<Date>
<Time>
<Name of tester>

12. Disassemble/load the smoke testing hardware. Confirm that no equipment, materials, trash, etc.,

3.09 OTHER EXECUTION REQUIREMENTS:

A. Any trenching, excavation, or other construction work performed below grade, and in communication with the soil, is subject to soil-gas infiltration and methane accumulation; which could create a potential hazard to personnel, equipment, and the Project site. Special safety precautions as follow are to be employed during this work effort.

1. A combustible gas indicator, recently calibrated to methane, shall be used at all times during trenching, excavation and similar sub-grade construction operations to detect the presence of methane gas in and around the immediate work area.

2. Monitoring for methane, including the operation and calibration of the monitoring device, shall be the sole responsibility of the Contractor. The Contractor shall employ a Competent Person who will be of sufficient skill, via training and/or experience, to operate the monitoring device, recognize methane-related hazards, and who can implement and direct corrective actions if accumulations of methane are detected.

3. Monitoring for the presence of methane may be periodic or continuous, and will be at the discretion of the Contractor's on site Competent Person.

4. If methane is detected above 5,000-ppmv (10% of the LEL), remedial actions shall be implemented to mitigate methane accumulations in the immediate work area. If methane is detected above 10,000-ppmv (20% of the LEL), all work shall immediately stop, the area shall be evacuated, and aggressive remedial actions shall be implemented. Work in the area shall not recur until the concentration of methane has been reduced to below 5,000-ppmv. If required, an exhaust blower may be used to reduce or eliminate gas accumulations during trenching or sub-grade construction operations. The exhaust blower shall have an explosion proof motor and extension cord.

5. When trenching or excavating deeper than 2-feet, or in the presence of detectable concentrations of methane gas, operation equipment shall be fitted with spark-proof exhaust and foam fire extinguisher.

6. An exhaust blower may be used to reduce or eliminate methane gas concentrations during subgrade operations. The exhaust blower shall have an explosion proof motor and extension cord.

7. Precautions must be taken during all welding operations to prevent sparks from contacting combustible gas mixtures.

8. Precautions must be taken to monitor for methane, and/or ventilate, any confined space or void in communication with the soil that has been temporarily covered to prevent persons from accidentally falling into the void (e.g., the excavation for the sump).

9. Smoking shall not be permitted in any work area of the Project Site that has not been designated by the Contractor as a "Smoking Area".

B. The Contractor shall provide appropriate dust control measures during all excavation work following the procedures provided in Division 2.

C. The Contractor shall notify the gas mitigation Engineer at least two (2) working days prior to the start of construction on any element of the gas migration control system. An updated project schedule shall also be provided to the Engineer as soon as changes are made.

D. Reference the Architectural and Structural Drawings to verify exact building dimensions and elevations.

E. A qualified firm with extensive experience installing the membranes specified herein shall perform all membrane installation, repairs and tests. The number of membrane seams, splices, and laps made in the field must be kept to a minimum.

F. The method of membrane installation, which includes jointing, seaming, and all other physical connections shall be in accordance with the membrane manufacturer's recommendations unless shown or noted otherwise on the Drawings or in this Section.

G. All penetrations through the membrane shall be sealed according to the details shown on the Drawings using prefabricated boots made up of the specific membrane material being used.

H. All surfaces shall be trimmed smooth to the exact contours and elevations shown on the GP Drawings. All loose earth, cobbles, wire tacks, and other foreign matter shall be completely removed prior to placing membrane materials.

I. Care shall be exercised in placing and compacting the backfill material on top of the membrane. Backfill material shall be deposited on or pushed onto the membrane from a working edge in advance of any working equipment. No equipment shall be on the membrane without having at least 12-inches of backfill material under the wheels of any heavy equipment.

J. All forming for slabs, footing, etc., must be constructed in a way that is not supported by the membrane at any time. Foundation framing, rebars, and rebar chairs are not to be directly placed on the membrane. Stakes, staples, bars, etc. cannot penetrate the membrane unless sealed and booted.

K. Any necessary repairs to the membrane shall be performed by a qualified firm and patched with the membrane material itself, lap-jointed by a minimum of four (4) inches.

L. Any future work that will result in penetration of the membrane will require approval from the LADBS prior to any construction.

M. Warning signs shall be installed in prominent locations on each parking level of the building, and so located that they will not be covered or occluded. The signs shall include the following information:

> "WARNING: A methane gas membrane/barrier is installed beneath this building's concrete to prevent gas intrusion from the soil. Any proposed penetration or alteration of the concrete requires prior written notification to the LADBS. It is illegal to remove this sign."

1. Signs shall be placed near the center of each floor slab in contact with the earth in parking levels P3 and P4.
2. Signs shall be placed near the center of each shotcrete wall in contact with the earth in parking levels P1, P2, P3 and P4.

N. The word "WARNING" shall be in white letters, a minimum of 3/4-inch high, and the remaining words shall be white letters 3/8-inch high. All words shall be placed on a red background.

O. Electrical Conduit Seals: Electrical conduits shall be provided with seals as required by appropriate sections of Article 501 of the National Electrical Code for Class 1, Division 1, Group D locations, wherever conduit transitions from below grade to above grade. (Refer to Electrical Seal Off and Trench Dams detail sheet on GP Drawings for details).

1. Application of NFPA 70 (National Electrical Code) to this Section:

   a. Class 1 Division 1 is an area where methane gas may be expected at least periodically;

   b. Class 1 Division 2 is an area where methane gas would only occur if protection systems fail;

(1) Class 1 Division 1 at this Project is the area under or outside of the membrane. EYS fittings are required on any electrical conduit that (a) passes through the membrane into the structure; or (b) passes directly from the soil outside of the building footprint into structure.

(2) Class 1 Division 2 at this Project includes all areas between the slab/foundation and the gas barrier. Electrical cable can be run through a Class 1 Division 2 area without EYS (y-seal) fittings, provided both of the following conditions are met.

(a) The cable is enclosed in a gas tight sheath of metallic or nonmetallic material (i.e., plastic conduit is acceptable); and,
(b) The run originates outside of a classified area (such as inside the structure), and terminates uninterrupted again outside of the classified area (such as inside the structure).

c. All NFPA 70 requirements shall be met for all work in any classified area, given the above classifications at the project.

P. General Electrical Controls Requirements: Electrical conduits shall be provided with seals as required by the appropriate sections.

1. All material furnished under this contract shall be of the highest grade available, free from defects, and imperfections, of recent manufacture, and unused.

2. All items of the equipment shall be the product of a manufacturer experienced in the design, and operation of the equipment for the purpose required, and said manufactures shall have established a record of successful operation of such equipment manufactured or produced by them.

3. If necessary, modifications shall be made to the manufacturer's standard product to make it conform to the specific requirements of the specifications and to the requirements contained in regulations by the public agencies. Such modifications shall be noted in the Shop Drawing submittals.

4. A brass or stainless steel nameplate shall be attached to each piece of equipment with the following information plainly marked on the nameplate:

a. Name and address of the manufacturer;
b. Serial number; and
c. Any other information necessary for complete identification of the item of the equipment.

Q. Utility Trench Dams:

1. A horizontal gas migration barrier shall be installed in all utility trenches that extend beneath the building's foundation from areas outside the perimeter of the building and in all utility or other trenches that extend across the Project boundary.

2. The migration barrier shall be installed in each utility trench immediately adjacent to exterior perimeter of the building's foundation. The dam shall extend for a distance of at least five (5) feet from the perimeter of the structure.

3. The gas migration barrier shall consist of one of the following:

a. A minimum 3-foot continuous length of slurry consisting of mixture of 26 % Type II Cement, 8 % powdered bentonite and 66% water by weight. Slurry shall extend up from the bottom of the utility trench to a level of 6-inches above top of the utility's (conduit) bedding material; or
b. A minimum 5-foot continuous length of native soil backfill compacted to not less than 90% Relative Compaction in accordance with ASTM D-1557 testing procedures. The compacted soil backfill shall be carefully and fully compacted around the conduit and extend from the bottom of the utility trench to a level at least 6" above top of the utility's (conduit) bedding material.

R. General Notes:

1. The Contractor shall verify all locations of existing utilities, drainage and irrigation lines in the Project area. Unless shown otherwise, all existing utilities shall be left in place and the Contractor shall conduct his operation in such a manner that the utilities are protected at all times. In a case where utilities are damaged due to construction of the gas mitigation systems, the Contractor shall replace them to their original condition or as directed by the Engineer, without any cost to the Owner.

2. The Contractor shall dispose of all surplus materials, waste products and debris, and shall make necessary arrangements for such disposal.

3. The Contractor shall solely be responsible for furnishing, erecting, maintaining, and removing all the protecting barriers (construction fencing), signs, temporary lighting, etc., required for the protection of persons and the Project.

4. The Contractor shall be responsible for dust and noise control during construction of the gas mitigation system.

5. Any trenching, excavation, or other work below grade is subject to gas infiltration from the soil, which could create a potential hazard to personnel. Special safety precautions shall be employed during this work and shall include:

a. Smoking shall only be permitted in designated areas.
b. Monitoring for methane shall be performed in all areas subject to soil-gas intrusion.

3.10 PROTECTION: Protect the Work of this Section until Substantial Completion.

3.11 CLEANUP : Remove and legally dispose of rubbish, debris, and waste materials from the Project site.

TABLE 1 -- GRAIN SIZE FOR SUB-SLAB SAND

SIEVE SIZE	PERCENTAGE PASSING SIEVE
No. 6 (3.35mm)	100
No. 8 (2.36mm)	98-100
No. 12 (1.70mm)	55-89
No. 16 (1.18mm)	10-46
No. 20 (0.85mm)	1-13
No. 30 (0.60mm)	0-5

TABLE 2 -- GRAVEL

SIEVE SIZE	PERCENTAGE PASSING SIEVE	
	No. 3	No. 4
3/4" (19/0mm)	55-85	100
3/8" (9.5mm)	8-20	85-100
No. 4 (4.75mm)	0-5	0-10
No. 8 (2.36mm)	0-5	0-10
No. 200 (75mm)	0-2	0-2
ASTM C 131 TEST GRADING	B	C

TABLE 3 -- PROPERTIES OF GEOTEXTILE FABRIC

PROPERTY	TEST METHOD	VALUE
WEIGHT	ASTM D3776	10 OZ/SQ YD
THICKNESS	ASTM D1777	100 ML
TENSILE STRENGTH	ASTM D1682	435 LB
ELONGATION	ASTM D1682	80%
PUNCTURE STRENGTH	ASTM D751	180 LB
MULLEN BURST STRENGTH	ASTM D3786	575 LB
COEFFICIENT OF PERMEABILITY	CONSTANT HEAD 50 MM	0.3 CM/SEC
ABRASION RESISTANCE	ASTM D3884	200 LB

PROPERTIES OF 60-mil HDPE MEMBRANE

60 ML HDPE PROPERTY	TEST METHOD	VALUE
GAUGE (NOMINAL)	--	60
THICKNESS, MILS MINIMUM +/-10%	ASTM D1593 PARA. 8.1.3	54
SPECIFIC GRAVITY MINIMUM	ASTM D792 METHOD A	.094
MINIMUM TENSILE PROPERTIES EACH DIRECTION	ASTM D638	
1. TENSILE STRENGTH YIELD (LB/IN WIDTH)		120
2. TENSILE STRENGTH AT BREAK (LB/IN WIDTH)		180
3. ELONGATION AT YIELD (PERCENT)		10
4. ELONGATION AT BREAK (PERCENT)		500
5. MODULUS OF ELASTICITY (LB/SQ IN)		80,000
TEAR RESISTANCE (LB/MINIMUM)	ASTM D1004 DIE C	30
LOW TEMPERATURE, F°	ASTM D746 PROCEDURE B	-40
DIMENSIONAL STABILITY EACH DIRECTION (PERCENT CHANGE DIRECTION)	ASTM D1204 212°, 15 MIN.	+/-3
RESISTANCE TO SOIL BURIAL (PERCENT CHANGE MAXIMUM IN ORIGINAL VALUE)	ASTM D3083 AS MODIFIED IN APPENDIX A	
1. TENSILE STRENGTH YIELD		10
2. TENSILE STRENGTH AT BREAK		10
3. ELONGATION AT YIELD		10
4. ELONGATION AT BREAK		10
5. MODULUS OF ELASTICITY		10

PROPERTIES OF 60-mil HDPE MEMBRANE

60 ML HDPE PROPERTY	TEST METHOD	VALUE
ENVIRONMENTAL STRESS CRACK (MINIMUM, HOURS)	ASTM D1693 AS MODIFIED IN APPENDIX A	500
FACTORY AND FIELD SEAM REQUIREMENTS		
BONDED SEAM STRENGTH (FACTORY SEAM BREAKING FACTOR, PPI WIDTH)	ASTM D3083 AS MODIFIED IN APPENDIX A	108
PEEL ADHESION (LB IN MINIMUM)	ASTM D413 AS MODIFIED IN APPENDIX A	FILM TEAR BOND
DEAD LOAD ROOM TEMPERATURE 73° F 50% BONDED SEAM LOAD	APPENDIX A	PASS
ELEVATED TEMPERATURE 158° F 25% BONDED SEAM LOAD	APPENDIX A	PASS
RESISTANCE TO SOIL BURIAL PEEL ADHESION	ASTM D3083 AS MODIFIED IN APPENDIX A	FILM TEAR BOND
BONDED SEAM STRENGTH (PERCENT CHANGE MAXIMUM IN ORIGINAL VALUE)		-20

PROPERTIES OF 100-mil HDPE MEMBRANE

100 ML HDPE PROPERTY	TEST METHOD	VALUE
ENVIRONMENTAL STRESS CRACK (MINIMUM, HOURS)	ASTM D1693 AS MODIFIED IN APPENDIX A	500
FACTORY AND FIELD SEAM REQUIREMENTS		
BONDED SEAM STRENGTH (FACTORY SEAM BREAKING FACTOR, PPI WIDTH)	ASTM D3083 AS MODIFIED IN APPENDIX A	135
PEEL ADHESION (LB IN MINIMUM)	ASTM D413 AS MODIFIED IN APPENDIX A	FILM TEAR BOND
DEAD LOAD ROOM TEMPERATURE 73° F 50% BONDED SEAM LOAD	APPENDIX A	PASS
ELEVATED TEMPERATURE 158° F 25% BONDED SEAM LOAD	APPENDIX A	PASS
RESISTANCE TO SOIL BURIAL PEEL ADHESION	ASTM D3083 AS MODIFIED IN APPENDIX A	FILM TEAR BOND
BONDED SEAM STRENGTH (PERCENT CHANGE MAXIMUM IN ORIGINAL VALUE)		-20
1. TENSILE STRENGTH YIELD (LB/IN WIDTH)		180
2. TENSILE STRENGTH AT BREAK (LB/IN WIDTH)		300
3. ELONGATION AT YIELD (PERCENT)		10
4. ELONGATION AT BREAK (PERCENT)		500
5. MODULUS OF ELASTICITY (LB/SQ IN)		80,000
TEAR RESISTANCE (LB/MINIMUM)	ASTM D1004 DIE C	50
LOW TEMPERATURE, F°	ASTM D746 PROCEDURE B	-40
DIMENSIONAL STABILITY EACH DIRECTION (PERCENT CHANGE DIRECTION)	ASTM D1204 212°, 15 MIN.	+/-3
RESISTANCE TO SOIL BURIAL (PERCENT CHANGE MAXIMUM IN ORIGINAL VALUE)	ASTM D3083 AS MODIFIED IN APPENDIX A	
1. TENSILE STRENGTH YIELD		10
2. TENSILE STRENGTH AT BREAK		10
3. ELONGATION AT YIELD		10
4. ELONGATION AT BREAK		10
5. MODULUS OF ELASTICITY		10

PROPERTIES OF 100-mil HDPE MEMBRANE

100 ML HDPE PROPERTY	TEST METHOD	VALUE
GAUGE (NOMINAL)	--	100
THICKNESS, MILS MINIMUM +/-10%	ASTM D1593 PARA. 8.1.3	90
SPECIFIC GRAVITY MINIMUM	ASTM D792 METHOD A	.094
MINIMUM TENSILE PROPERTIES EACH DIRECTION	ASTM D638	
1. TENSILE STRENGTH YIELD (LB/IN WIDTH)		180
2. TENSILE STRENGTH AT BREAK (LB/IN WIDTH)		300
3. ELONGATION AT YIELD (PERCENT)		10
4. ELONGATION AT BREAK (PERCENT)		500
5. MODULUS OF ELASTICITY (LB/SQ IN)		80,000
TEAR RESISTANCE (LB/MINIMUM)	ASTM D1004 DIE C	50
LOW TEMPERATURE, F°	ASTM D746 PROCEDURE B	-40
DIMENSIONAL STABILITY EACH DIRECTION (PERCENT CHANGE DIRECTION)	ASTM D1204 212°, 15 MIN.	+/-3
RESISTANCE TO SOIL BURIAL (PERCENT CHANGE MAXIMUM IN ORIGINAL VALUE)	ASTM D3083 AS MODIFIED IN APPENDIX A	
1. TENSILE STRENGTH YIELD		10
2. TENSILE STRENGTH AT BREAK		10
3. ELONGATION AT YIELD		10
4. ELONGATION AT BREAK		10
5. MODULUS OF ELASTICITY		10

END OF SECTION

SECTION 14200

ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide electric traction elevators complete as shown and specified, complete and operable.

A. Related Work Interfaced With This Section:

1. Life Safety or Public Address Speakers: Furnished by others; wire from the machine room to car, accommodations and installation in car canopy by this Section.
2. Card Readers: Furnished by others; wire from machine room to car, interfacing with elevator controls and installation in elevator car by this Section. Connection in machine room and testing by others.
3. Close Circuit TV: Furnished by others; wire from machine room to elevator car by this Section. Connection in machine room and testing by others.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Shop Drawings: Submit as required by the Owner or Architect. The Owner or Architect reserve the right to require any details of any portion of the equipment.

1. Layouts -- Plan and section of hoistways, pits, and machinery spaces; include impact and static loads imposed on building structure, location of hoistway ventilation, and required clearances around the equipment.
2. Details -- Submit details of cabs, fixtures, and entrances.
3. Data -- Indicate on layouts or separate data sheets; machine spaces heat release, power requirements, conduit runs outside of hoistways and machine rooms, car and counterweight roller guides, and door operators.

B. Samples: Submit Samples of materials and finishes exposed to public view and additional, if specifically requested, 6 inch x 6 inch panels, 12 inch lengths or full size if smaller, as applicable.

C. Operating Instructions: Submit manufacturer's literature describing system operations and special operations as specified.

1.03 QUALITY ASSURANCE:

A. Qualifications of Bidders: The entire elevator installation shall be manufactured, installed and maintained by an acceptable manufacturer listed or as qualified by addendum. No portion of the work shall be subcontracted unless qualified and accepted by addendum. Equipment proposed must have a history of successful operation under similar conditions for the last two (2) years.

B. Acceptable Bidders: One of the following or as approved by addendum. Those not listed must pre-qualify ten (10) days prior to bid date. Submit list of at least three (3) projects representing equivalent equipment that has been operational for at least two (2) years. Include owner's name, person to contact, and telephone number.

1. Eligible Bidders:

a. Fujitec Elevator Company.
b. Kone Elevator Company.
c. Mitsubishi Elevator Company.
d. Otis Elevator Company.
e. ThyssenKrupp Elevator Company.

2. Maintenance Qualifications: Performed by manufacturer installing elevator:

a. Show evidence of successful experience in complete maintenance of elevators.
b. Directly employ sufficient competent personnel within 50 miles of project to handle service
c. Maintain local stock of parts adequate for replacement on permanent or emergency basis
d. Respond to trouble calls within one hour.
e. Offer the Owner agreement for continuing maintenance after expiration of maintenance period under this Section.

3. Elevator Cars and Entrances: One of the following or accepted equal:
   a. Elevator Manufacturer.
   b. Brice Southern
   c. Hauenstein and Burmeister.
   d. Tyler Elevator Products.

4. Mock-Up: Erect one complete production passenger car at place of manufacture to demonstrate fit, finish and assembly techniques used in final assembly.

C. Requirements of Regulatory Agencies:

1. Codes: In accordance with the latest applicable edition requirements of the following and as specified:
   a. ADA: Americans with Disabilities Act.
   b. ASME: American Society of Mechanical Engineers - A17.1; Safety Code for Elevators and Escalators.
   c. CBC: Title 24; California Building Codes.
   d. CCR: Titles 8; California Code of Regulations.
   e. NEC: National Electric Code.
   f. UBC: Uniform Building Code.
   g. All local codes, which govern.

2. Permits: Arrange and pay for inspections by governing authorities and obtain operating permits.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING: Protect equipment during transportation, erection and construction. Store under cover to prevent damage due to weather conditions. Replace damaged materials.

1.05 SEQUENCING AND SCHEDULING: Schedule and be responsible for coordinating related work with other trades to avoid omissions and delays in job progress.

1.06 WARRANTY: Conform to Section 01790 and following requirements. Furnish special project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator work which may develop within one (1) year from final date of completion and acceptance of the entire installation by the Owner. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration and similar unusual, unexpected, and unsatisfactory conditions.

1.07 ALTERNATES: Refer to Section 01230 for basic requirements.

A. Alternate No. ELEV-1: Continuing Full Maintenance Contract:

1. Quote cost and submit manufacturer's proposal for full maintenance contract for a period of five (5) years after expiration of 12-month maintenance provided with this new installation.
2. Provide weekly examinations, lubrication and replacements in accordance with the manufacturer's standard practice. Include a minimum of one and one-half hour per traction elevator and one-half hour per hydraulic elevator per visit performing only preventative maintenance. Any work required performing repairs or answering trouble calls shall be in addition to the preventive maintenance hours.
3. Provide 24-hour emergency call back (entrapments) service and trouble callbacks after hours during normal working hours at no cost to Owner. Trouble callbacks after hours shall be billable for the premium time portion only.

B. Alternate No. ELEV-2: Overhead Machines Elevator Nos. 1-3:

1. Provide overhead machine arrangement similar to Elevator Nos. 4-6.
2. Provide 10'-0" high cabs and 8'-0" high doors.

PART 2 - PRODUCTS:

2.01 DESCRIPTION OF SYSTEMS:

A. Elevators No. 1-3;Passenger Parking

1. Type: Geared Traction
2. Capacity: 3500 Pounds
3. Speed: 350 FPM

4.	Stops:	5
5.	Openings:	5 In Line
6.	Travel:	As Shown
7.	Control:	AC/VVVF
8.	Operation:	Group Operation
9.	Machine Location:	Below Underslung
10.	Compensation:	As Required By Manufacturer
11.	Special Operations:	
	a. Independent Service	
	b. Fire Emergency Service	
	c. Standby Emergency. Power	
	d. Anti-Nuisance Service	
	e. Tenant Security	
12.	Car Enclosure Type:	Passenger
	a. Platform Size:	7'-0" W by 6'-2" D by 8'-0" H
	b. Inside Clear:	6'-8" W by 5'-5" D by 7'-6"
	c. Signals and Fixtures:	Design as Specified
	d. Car Operating Panels:	2 Per Car; Swing Type
	e. Car Position Indicator:	Integral with Each Car Panel
	f. Communication System:	Integral with Car Panel
	g. Service Cabinet:	Integral with Car Panel
	h. Hall Pushbuttons:	2 Risers
	i. Hall Lanterns:	All Floors
13.	Passenger Entrance Type:	Center Open, Single Speed
	a. Size:	3'-6" W by 7'-0" H
	b. Frames:	
	(1) Main Floor	Stainless Steel
	(2) Typical Floors	Stainless Steel
	c. Doors:	
	(1) Main Floor	Stainless Steel
	(2) Typical Floors	Stainless Steel
	d. Sills:	
	(1) Main Floor	Aluminum
	(2) Typical Floors	Aluminum
14.	Miscellaneous Items:	
	a. Disabled Access Requirements	
	b. Key Operated Hoistway Access	
	c. Earthquake Requirements	
	d. Card Reader Provisions	

B. Elevator No. 4-6; Passenger Office Tower

1.	Type:	Geared Traction
2.	Capacity:	3500 Pounds
3.	Speed:	350 FPM
4.	Stops:	5
5.	Openings:	5 In Line
6.	Travel:	As Shown
7.	Control:	AC/VVVF
8.	Operation:	Group Operation
9.	Machine Location:	Overhead
10.	Compensation:	As Required By Manufacturer
11.	Special Operations:	
	a. Independent Service	
	b. Fire Emergency Service	
	c. Standby Emergency Power	
	d. Anti-Nuisance Service	
	e. Tenant Security	
12.	Car Enclosure Type:	Passenger
	a. Platform Size:	7'-0" W by 6'-2" D by 10'0" H
	b. Inside Clear:	6'-8" W by 5'-5" D by 9'-6" H
13.	Signals and FixturesDesign:	As Specified
	a. Car Operating Panels:	2 Per Car; Swing Type
	b. Car Position Indicator:	Integral with Each Car Pane
	c. Communication System	Integral with Car Panel

d.	Service Cabinet:	Integral with Car Panel
e.	Hall Pushbuttons:	2 Risers
f.	Hall Lanterns:	All Floors
14. Passenger Entrance Type:		Center Open, Single Speed
a.	Size:	3'-6" W by 8'-0" H
b.	Frames:	
(1)	Main Floor	Stainless Steel
(2)	Typical Floors	Stainless Steel
c.	Doors	
(1)	Main Floor	Stainless Steel
(2)	Typical Floors	Stainless Steel
d.	Sills:	
(1)	Main Floor	Aluminum
(2)	Typical Floors	Aluminum
15. Miscellaneous Items:		
a.	Disabled Access Requirements	
b.	Key Operated Hoistway Access	
c.	Earthquake Requirements	
d.	Card Reader Provisions	
e.	Counterweight Safties	

C. Elevator No. 7; Service

1. Type:	Geared Traction
2. Capacity:	4500 Pounds
3. Speed:	350 FPM
4. Stops:	9
5. Openings:	9 In Line
6. Travel:	As Shown
7. Control:	AC/VVVF
8. Operation:	Simplex Selective Collective
9. Machine Location:	Overhead
10. Compensation:	As Required By Manufacture
11. Special Operations:	
a. Independent Service	
b. Fire Emergency Service	
c. Standby Emergency Power	
d. Anti-Nuisance Service	
e. Tenant Security	
12. Car Enclosure Type:	Service
a. Platform Size	6'-0" W by 8'-10 D by 10'-0" H
b. Inside Clear	5'-8" W by 7'-11" D by 10'-0" H
13. Signals and Fixtures:	Design as Specified
a. Car Operating Panels	1 Per Car; Applied Type
b. Car Position Indicator	Integral with Each Car Transom Panel
c. Communication System	Integral with Car Panel
d. Service Cabinet	Integral with Car Panel
e. Hall Pushbuttons	1 Riser
f. Hall Lanterns	All Floors
g. Hall Pos. Indicators	All Floors
14. Passenger Entrance Type:	Side Open, Two Speed
a. Size	4'-0" W by 8'-0" H
b. Frames:	
(1) Main Floor	Stainless Steel
(2) Typical Floors	Stainless Steel
c. Doors:	
(1) Main Floor	Stainless Steel
(2) Typical Floors	Stainless Steel
d. Sills:	
(1) Main Floor	Aluminum
(2) Typical Floors	Aluminum
15. Miscellaneous Items:	
a. Disabled Access Requirements	
b. Key Operated Hoistway Access	

c. Earthquake Requirements
d. Card Reader Provisions

2.02 MATERIALS:

A. Aluminum: Alloy and temper best suited for anodizing finish specified.

B. Bronze: CDA Alloy 280, muntz metal.

C. Glass: Laminated Safety Glass meeting ANSI Z97.1.

D. Nickel Silver: CDA Alloy 796, leaded nickel silver.

E. Plywood: PS-1, A-D exterior Grade Douglas Fir, fire retardant treated.

F. Sheet Steel: ASTM A366, uncoated, pickled, free from defects.

G. Sound Deadener: Fire retardant; spray, roller or adhesive applied; 3/16 inch thick.

H. Stainless Steel: ASTM A167; type 302 or 304.

2.03 FINISHES:

A. Exposed-to-View Surfaces. Provide as follows unless otherwise specified.

1. Aluminum: Clear anodized finish.

2. Sheet Steel:

a. Shop Prime: Degrease clean of foreign substances and apply one coat of corrosion inhibiting primer compatible with finish paint selected. Hoistway items visible to public shall be painted one additional coat of black paint.

b. Finish Paint: Factory applied baked enamel or powder coat; color as selected.

3. Stainless Steel:

a. Plain: Satin, directional polish, No. 4 finish unless otherwise specified.

b. Patterned: Rigidized Metal's No. 5 WL, RIMEX Metals No. 5-SM or equal.

4. Touch-Up:

a. Prime Surfaces: Use same paint as factory for field touch-up.

b. Finish Painted Surfaces: Refinish whole panel with shop prime and finish paint as specified above.

B. Non-Exposed-to-View Surfaces: Degrease and shop paint manufacturer's standard corrosion inhibiting primer.

2.04 AUTOMATIC OPERATION:

A. General Operation of Individual Elevators:

1. Provide a non-proprietary microprocessor-controlled dispatching system designed to monitor all types of traffic and sufficiently flexible so that it can be modified to accommodate changes in traffic patterns. Include hardware necessary to protect hoist motors, motor drives and door operators. Software shall control group and simplex program operations.

2. Pre-Approved Products:

a. ThyssenKrupp TAC 50
b. Fujitec Millennium II
c. Mitsubishi OS 210

d. Otis Elevonic
e. Schindler Miconic
f. Motion Control Engineering
g. Swift Futura

3. The system shall continuously monitor the demand based on real time calculations to assign and reassign the elevators to handle the traffic in the most efficient manner.

4. Provide "anti-nuisance service" whereby all car calls will be cancelled if the load-weighing device detects that an abnormal number of calls are registered given the number of passengers in the car. System using false call answering to accomplish this is not acceptable.

5. Serial Link Communications: Provide a distributed processing network consisting of localized processors located in machine rooms, car stations, hall stations and top of car to allow system to make fast decisions based on data shared by the processor involved in the different operations of the elevators. For group dispatch operations, all elevators in the group shall be capable of acting as a group common dispatcher as the need arises.

6. Fault Diagnostic System: Provide Owner with all hardware such as on-board LED. Diagnostics, hand held device or laptop computer, as standard with manufacturer, and supporting software documentation. Diagnostic system shall be capable of determining faults most difficult to find.

B. Group Automatic Operation; For Two or More Cars:

1. Provide an "on-demand" hall call response system that will continuously scan the hall calls and assign the closest elevator in time to respond to that call. The system shall be capable of reassigning the elevator if demand changes the real time calculation.

2. A car with no car calls registered arriving at a floor where both "up" and "down" hall calls are registered shall respond to the hall call in the direction of travel and illuminate the appropriate lantern. If no car call is registered for that direction, the lantern shall be extinguished, the lantern for the other direction shall light and the car shall respond to the call in that direction. The doors shall not close and reopen.

3. The system shall be capable of monitoring hall and car calls to monitor coincidental calls. The cars will continuously scan the whole system to determine the closest elevator in time taking into account the coincidental car and hall call.

4. Other Required Features:

a. Should a car be delayed from leaving a floor for any reason, other cars shall respond to the hall calls at that floor and shall be dispatched in a normal manner.
b. Provide each car with an adjustable load-weighing device, which will immediately dispatch cars and bypass hall calls when car is loaded to predetermined load.

5. General Program Adjustments:

a. After each group of elevators have been placed in regular service and the building substantially occupied, the elevators shall be regularly observed under normal operating conditions and minor adjustments shall be made as found necessary to ensure that the elevators operate at maximum efficiency.

b. If zones are employed, arrangements shall be made in the control circuits of the elevators for the division between each zone to be raised or lowered if found necessary due to uneven distribution of traffic between the zones and/or staffing requirements.

C. Simplex Selective Collective Operation: Arrange for Simplex Selective Collective automatic operation. Operate elevators from a single riser of landing buttons and from operating device in car.

1. Momentary pressure of one or more car or landing buttons, other than those for landing at which car is standing, starts car, and causes car to stop at first landing for which a car or landing call is registered corresponding to direction in which car is traveling. Stops made in order in which landings are reached, irrespective of sequence in which calls are registered.

2. Double door operation not permitted. If an up traveling car has a passenger for an intermediate floor and a down call is registered at that floor, with no calls above car, it travels to floor, opens door to let passenger out, then lights down direction arrow in hall lantern and accepts waiting passenger without closing and reopening doors.

2.05 SPECIAL OPERATIONS:

A. Inspection Operation: Provide key-operated hoistway access device and car top operating device. Key switches shall be mounted in doorframes with only ferrule exposed at terminal landings.

B. Independent Service: Independent service operation shall be provided so that, by means of a switch located in the car service cabinet, the car can be removed from automatic operation and be operated by an attendant. The attendant shall have full control of the starting, stopping and direction of car travel. The car shall respond to car buttons only. The hall signals for the car on independent service shall not operate.

C. Operation Under Fire or Other Emergency Conditions: Provide special emergency service to comply with ASME A17.1, CCR Title 8, UBC and local codes having jurisdiction. Provide Phase 1 recall switch at Main Floor Elevator Lobby and Fire Control Life Safety Room. Interlock recall switches to prevent simultaneous activation. Key switches at main floor shall be integrated in hall button station with engraved instructions.

D. Operation Under Earthquake Conditions: Provide seismic operation in accordance with ASME A17.1. Provide a dual ring and string, continuously monitoring type counterweight displacement device for each counterweight with rings mounted on diagonal corners of frame. Provide a seismic switch device measuring both horizontal and vertical accelerations for each group of elevators located per manufacturer's recommendations.

E. Operation Under Emergency Power System:

1. General: The standby power system is sized to operate one elevator in each group simultaneously. Elevators shall be grouped as follows:

Group 1 = Elevators No. 1-3
Group 2 = Elevators No. 4-6
Group 3 = Elevators No. 7

a. When normal power fails and standby power becomes available, a signal will be given to the controllers, all elevators will shut down, and all car lights, etc., will be extinguished.

b. When emergency power comes onto the line, power for lighting car fan and alarm bell shall be automatically transferred and all cars on automatic operation shall be sequentially returned one at a time from each group, to the main floor.

c. After all cars are parked at main floor, one car of each group shall resume normal operation.

d. Provide interlocking illuminated strip switches to permit manual selection of desired elevator to operate on emergency power.

e. When normal power fails and emergency power is used, or when normal power is restored, the Elevator Manufacturer shall provide all circuitry necessary, including time delay or auxiliary relays required to accomplish safe, continuous elevator operation. The cars will start in sequence, not simultaneously; allow 10 seconds between starts.

f. Fire service and derailment devices shall be operable when system is on emergency power operation.

F. Tenant Security: Provide CRT and keyboard in Guard Control Station to enable and disable car call buttons as follows:

1. Function, which locks out all cars in a group so that all car buttons are inoperative, except the main floor.

2. Function which locks out any selected car button for all elevators in a group serving that floor.

3. Tenant security operations can be overridden by cars on independent, any special emergency service or by card reader access.

2.06 DOOR OPERATION:

A. Passenger Type Horizontal Sliding:

1. Door Operator: Provide heavy-duty master type operators with direct current motor; closed-loop door operators, equal to Otis HPLIM or I-Motion, ThyssenKrupp HD98, Mitsubishi LV4K, GAL-MOVFR or MAC DPSS.

a. Provide door times available as specified under "Design Criteria".
b. Car and hoistway doors shall open and close simultaneously, quietly and smoothly; and door movement shall be cushioned at both limits of travel. Door operation shall not cause cars to move appreciably.
c. Door hold open times shall be readily and independently adjustable when car stops for a car or hall call. Main floor door hold times shall be adjustable independent of other floors.

2. Hangers and Tracks: Sheave type with two-point suspension. Steel sheaves with flanged groove and resilient sound-absorbing tires. Minimum 2-1/2 inch diameter for hoistway, 3 inch for car. Manufacturer's heavy-duty tracks and ball or roller bearing with adjustable up thrusts.

B. Door Protection; Passenger Type:

1. Electronic Scanning Type:

a. Provide a door protective system, which does not rely on physical contact with a person or object to inhibit door movement or initiate door reversal. Provide system equal to the Otis "Lambda II", Adams "I.C.U." or Janus "Panaforty".

b. The system shall be able to detect a 2-inch diameter rod introduced at any position within the door movement and between the height of 2 inches and 63 inches above sill level.

c. Detection of intrusion into the protected area shall cause the doors, if fully open, to be held in the open position and, if closing, to reverse to fully open position.

d. If doors are prevented from closing for an adjustable period of 15 to 45 seconds or upon activation of Fire Emergency Service, they shall proceed to close at reduced speed and a loud buzzer shall sound. Door closing force shall not exceed 2-1/2 ft.-lbs. when door re-opening device is not in operation.

e. For side-opening doors, detector for the strike jamb side shall be recessed, flush with strike jamb.

2. Door Hold Button; Elevator No. 7: Provide an illuminated door hold button, operation of which will hold the doors open for a predetermined and adjustable period of 20 to 90 seconds. Sound warning buzzer 5 seconds prior to expiration of time. Normal operation shall be resumed upon:

a. Expiration of door hold time.
b. Operation of door close button in car.
c. Operation of any floor button in car.

C. Interlocks: Equip each hoistway door with a tamper-proof interlock, which shall prevent operation of the car until doors are locked in the close position as defined by the Code. Interlock shall prevent opening of doors at landing from corridor side unless car is at rest at landing, is traveling through leveling zone or, hoistway access switch is used. Interlocks shall lock the two door sections together.

2.07 SIGNALS AND OPERATING FIXTURES:

A. General: Provide signals and fixtures as shown and specified. Location and arrangement of fixtures shall comply with handicap requirements.

1. Passenger Elevator Buttons: Provide minimum 1-inch diameter or square mechanical, white illuminated buttons raised 1/8 inch from surrounding surface with square shoulders and with engraved identifications. Operation of car or hall button shall cause button to illuminate. Response of car to car or hall call shall cause corresponding button to extinguish.

2. Service Elevator Buttons: Provide vandal-resistant stainless steel minimum 1 inch diameter or square mechanical buttons, raised 1/8 inch from surrounding surface with square shoulders and integral illumination equal to Adams, EPCO or GAL fixtures. Operation of car or hall button shall cause button to illuminate. Response of car to car or hall call shall cause corresponding button to extinguish.

3. Switches: Toggle type typically or key operated where noted.

4. Faceplates: Provide of material and finish as indicated and specified; 1/8 inch minimum thickness with sharp edges relieved. Unless otherwise specified provide stainless steel faceplates for all elevators.

5. Fastenings: Provide with concealed fasteners for passenger cars and with flush tamper-proof screws of material and finish matching faceplates for service elevators.

6. Cabinets: Provide with pulls, concealed hinges and doors mounted flush with hairline joints to adjacent surface.

7. Arrangement: Arrangement of fixtures shall generally conform to that specified, but components may be rearranged, if desired, subject to Owner's Representative's approval.

8. Engraving: Of size indicated; color backfill with epoxy paint in contrasting color as selected.

9. Lamps: Miniature LED type.

10. Audible Chimes: Electronic adjustable audible chimes; bell type gong not acceptable.

11. Provide floor passing signal of the adjustable electronic audible chime type.

12. Tactile Markings: Provide raised Braille and alpha characters, numerals or symbols to the left of operating buttons and devices used by the public. Indications may be engraved directly on faceplates or separate plates flush mounted with hairline joints and concealed mechanical fasteners. Plates shall be of same size and shape as buttons. Raised characters shall be white on a black background with Braille designation directly below the character.

B. Car Operating Panels:

1. General: Provide buttons numbered to conform to floors served and the following:

   a. Locate top operating button at 48 inches above floor; maximum 54 inches when required.
   b. Locate emergency stop and illuminated alarm button in bottom row at 35 inches above floor. Wire emergency stop to ring alarm bell.
   c. Provide "Door Open", "Door Hold", and "Door Close" buttons located above emergency stop and alarm of same design as car button.
   d. Engrave main panel with capacity, number of passengers and elevator number in 1/4-inch letters. Engrave auxiliary panel with NO SMOKING in 1-inch letters. All other signage required by local codes shall be engraved as directed by Owner's representative.
   e. Provide fire emergency key switch, engraved instructions and call cancel button with audible and visual signals and fire department phone jack located below emergency stop and alarm.
   f. Make provisions for card readers in Elevator No. 1-7.

2. Swing Type: Integrate cabinets, buttons and engraving into swing front return panels without applied faceplate. Entire front return shall swing on concealed hinges with concealed locking means for servicing.

3. Applied Type: Integrate cabinets, buttons and engraving into hinge single piece faceplate mounted to front return panel or sidewall adjacent to strike jamb.

C. Car Position Indicators: Provide car position indicators with indications corresponding to floor designations with matching direction arrows and floor passing chimes. Provide digital type alpha numeric direct readout indicator with minimum two-inch high indications mounted integral with each car-operating panel.

D. Hall Position Indicators No. 7: Digital type with 2-inch high indications. Combine with hall lanterns.

E. Service Cabinet: Provide cabinet door with a lock and concealed hinge as an integral part of car operating panel mounted with flush hairline joints. Cabinet door shall be provided with a flush glazed window of required size to hold elevator-operating permit. Service cabinet shall contain the following:

1. Independent service switch.
2. Two-speed ventilation switch.
3. Light switch or dimmer as applicable.
4. Inspection switch, key operated.
5. Duplex convenience outlet.
6. Buzzers as required.
7. Constant pressure test switch for emergency car lighting.
8. Card reader over-ride switch-key operated.

F. Speaker Phone: Provide a complete communication system in compliance with A.D.A. regulations consisting of a combination speaker/microphone, amplifier, automatic dialer with 4 number rollover capability and matching car station push button with telephone symbol to activate system and call-acknowledgement lights. Mount behind a pattern of holes as selected as an integral part of car operating panel. Wire to machine room and program automatic dialer as directed by Owner.

G. Hall Button Fixtures: Each fixture shall contain buttons, which light to indicate hall call registration and extinguish when call is answered. Engrave fire-exiting instructions on faceplates.

H. Hall Lanterns Nos. 1-6: Provide with single chime for up and double chime for down direction. Lantern illuminates white for up and red for down. As car approaches floor, lantern shall illuminate and chime approximately 4 seconds prior to doors opening to indicate next direction of travel. Provide manufacturer's standard plug-in type hall lanterns with round lenses without faceplates.

I. Car Lanterns No. 7: Manufacturer's standard car riding lantern mounted at a maximum height above floor. Lens shall be flush with faceplate or face of jamb. Lantern illuminates and chimes as doors open. Provide single chime for up direction and double chime for down direction.

J. Remote Control Stations: Provide indicator and control panels with wiring from elevator hoistways to and between remote stations as specified. Engrave operating instructions for controls, indicators, elevator numbers and floors served by each elevator or group of elevators. Coordinate quantity and size of conduit runs as specified under "Related Work Included In Other Sections". Provide manufacturer's system utilizing CRT device and keyboard incorporating all features specified. Panel shall be sized to suit space available and design as approved.

1. Guard's Lobby Control Stations: Locate as directed. Include the following devices for each elevator or group of elevators as applicable.

   a. Display showing status, position and direction of each elevator.
   b. Function to call and shut down each car at lobby with doors closed.
   c. Function to place cars on independent service operation and call car to lobby and park with doors open.
   d. Function for tenant security operation as specified under Special Operations.

2. Life Safety Control Station: Locate in Fire Control Room as indicated; size panel to suit space available, design as approved. Include the following for each elevator or group of elevators as applicable.

   a. Display showing status position and direction of each elevator.
   b. Three-position fire key switch with visual indication. Interlock with lobby key switch to prevent simultaneous activation.
   c. Display reading EMERGENCY POWER to illuminate as soon as main power fails. Manual selection switches for each car and display indicating which car are operating on standby (emergency) power.
   d. A compartment containing properly identified keys to operate all fire service switches. Provide tags with legible instructions on each key. Lock on compartment shall be subject to house master key or fire department key as approved.

2.08 WIRING:

A. General: Provide all necessary wiring with 15% or a minimum of four spares between cars and controllers and to all remote control stations. Furnish shielded wires in cables for all communications card readers and speakers. Include two additional pairs of shielded spares for each car.

B. Traveling Cables: Use minimum number of traveling cables with flame retarding and moisture resisting covers. Include shielded wires and spares as noted above. Cord thoroughly and protect cables from rubbing against hoistways or car items. Provide with steel cable core and properly anchored to relieve strain on individual conductors.

C. Work Light and Convenience Outlet: Provide on top of car with wire lamp guard.

D. Stop Switch: Provide in each pit and on top of car.

E. Alarm Gong: Six-inch size, 110 volt. Provide on top of each car and one per group inside of hoistway at main landing to be actuated by corresponding alarm button or emergency stop switch.

F. Auxiliary Disconnect Switches: Provide as required in remote controller rooms or at remote equipment not in view of mainline switches; include all wiring and conduit.

G. Coaxial Circuit: Provide for closed circuit television camera in elevators. Run from elevator car to machine room.

2.09 CAR ENCLOSURES:

A. General: Fabricate finish work smooth and free from warps, buckles, squeaks and rattles; joints lightproof. Car shall be sound isolated from car frame. Apply outside of car with 3/16-inch thick sound deadener. No visible fastenings, except as indicated.

B. Passenger Cars; Elevator No. 1-6: Provide passenger car enclosures as described below with final interior design and finishes as shown on Drawings.

1. Steel Shell: Fabricate walls of 14-gauge sheet steel from floor to canopy. Canopy 12 gauge reinforced. Paint shell in color as selected by Owner's representative.

2. Emergency Exit: Top of car per code.

3. Ventilation: Two-speed squirrel cage exhaust blower, Morrison model AA or equal, with sound isolation mounting on canopy. Provide concealed vents above base or ceiling as designed.

4. Car Doors: Fabricate from 16-gauge sheet steel on front and back of each panel sufficiently reinforced with steel to insure rigidity and sound deadened. Provide two guides per panel located one inch from each end. Provide full-length neoprene astragals. Finish car side with stainless steel and return finish 1/2 inch around edge of doors.

5. Protective Pads: Provide one set of heavy quilted protection pads for each group of elevators. Total three sets of pads required. Pads shall cover all walls with cut-out sections for car operating panels. Provide pads with rubber-coated 'J' type hooks sewn into top of pad for mounting on top of removable panels.

6. Front Return Panels: Provide full integral swing type front return panels fabricated from 14 gauge stainless steel.

7. Interior Panels, Ceiling, Lighting, Handrail, and Special Trim as shown on Drawings.

8. Sills: Provide extruded aluminum threshold plate. Mount with concealed mechanical fasteners. Allow for installation of finish flooring.

9. Finish Flooring: Carpet Tile as selected by Owner's Representative.

C. Service Elevator No. 7:

1. Steel Shell: Fabricate walls of 14 gauge patterned stainless steel. Extend from floor to canopy and heavily reinforce to withstand severe service.

2. Canopy and Lighting: 12 gauge reinforced stainless steel with recessed fluorescent light fixtures with protective lens. Protect light housing from damage.

3. Emergency Exit: Top of car per code.

4. Car Doors: Fabricate from 16-gauge sheet steel on front and back of each panel sufficiently reinforced with steel to insure rigidity and sound deadened. Provide two guides per panel located one inch from each end. Provide full-length neoprene astragals. Mount doors on structural header, not on car enclosure. Finish car side with stainless steel and return finish 1/2 inch around edge of doors.

5. Entrance Columns and Front Return: Provide front return panels fabricated from 14 gauge stainless steel.

6. Ventilation: two-speed squirrel cage exhaust blower, Morrison model AA or equal, with sound isolation mounting on canopy. Provide vent slots in base.

7. Bumper Rails: Provide 1/2 inch by 6-inch stainless steel No. 4 finish bar located at 12 inches above floor on all walls without entrances. Mount flat with countersunk mechanical fasteners securely attached to car shell.

8. Handrail: Provide a 1-1/2 inch diameter stainless steel rail on rear side wall mounted with matching brackets securely attached to car shell.

9. Attic: Provide a 2 feet 0 inch high recess in canopy from back edge of car crosshead to rear wall and full width of car enclosure.

10. Sills: Provide extruded aluminum threshold plate. Mount with concealed mechanical fasteners. Allow for installation of finish flooring.

11. Finish Flooring: Embossed rubber flooring by the R.C. Musson Rubber Co., or equal.

D. Emergency Lighting; All Elevators: Provide an emergency car lighting unit mounted on top of car, battery driven and self-rechargeable. Upon outage of normal power the unit shall, within 5 seconds, light two lamps as part of normal car lighting or separate lights mounted above drop ceiling. The unit shall have sufficient capacity to keep the lights in continuous operation for four hours and also the alarm bell for one hour. Provide a readily accessible means for testing the unit in service cabinet. Light fixtures mounted in car front returns or operating panels are not acceptable.

2.10 HOISTWAY ENTRANCES; PASSENGER TYPE:

A. General: Fabricate finish work smooth with flush surfaces and free from warps and buckles. Entrance assemblies shall bear 1-1/2 hour U.L. rating. Provide entrances of size and type as scheduled.

B. Struts and Closer Angles: As required for entrance installation and door closer mechanism. Use full-length struts. Hanger headers, minimum 3/16 inch material extending from strut to strut.

C. Dust and Hanger Covers: Provide as required of minimum 16-gauge sheet steel. Provide hanger cover plates extending full length of door track. Paint black.

D. Fascia, Toe and Head Guards: Minimum 16 gauge sheet steel; reinforce fascia. Paint black. Provide blind fascia in express zones or for reverse openings as required.

E. Sills: Extruded sills with non-slip surfaces and grooves suitable for guides. Extend strut to strut and mount without exposed screws. Provide all support angles and levelers for a complete installation. Sill material as scheduled.

F. Frames: Fabricate from 14-gauge material with side jambs in one continuous piece from sill to head section. Head and jamb flush bolted with hairline joint welded and ground smooth to provide unit frames with neat appearance from corridor side. Standard bolted frame for Elevator No. 7 will be acceptable. Material and finish of frames as scheduled.

G. Doors: Fabricate from 16-gauge material sufficiently reinforced with steel to insure rigidity and sound deadened. Provide two guides per panel, which will remain engaged in sill if guiding member is destroyed. Provide full-length neoprene astragals on leading edge and non-vision wings of material and finish to match doors. There shall be no keyholes in the door unless required by governing authority. Corridor side of door panel material and finish as scheduled. Return finish a minimum of 1/2 inch around edges of door.

H. Tactile Markings: Provide raised Braille and alpha characters, numerals or symbols similar to those for car stations of size required by governing authority. Locate on each entrance jamb at 60 inches above floor indicating floor designation. Material and finish of plates shall have contrasting background and mounting means similar to those on car panels. Braille designation shall be to the left of the raised character.

2.11 TRACTION ELEVATOR EQUIPMENT:

A. Design Criteria:

1. Performance:

a. Contract Speed: Maximum five percent (5%) speed variation under any loading condition in either direction.

b. Motion Time: Brake release to brake set as measured in both directions for a typical one floor run under any loading condition. After make-up of hoistway door interlock, initiate movement of car within 0.7 second for geared elevators.

(1) 350 FPM: 5.6 seconds.
(2) 450 FPM: 5.2 seconds.

c. Door Open Times:

(1) 3'-6" Center Open: 1.8 seconds.
(2) 4'-0" Side Open: 2.5 seconds.

d. Door Close Times: Minimum, without exceeding kinetic energy and closing force, allowed by code.

e. Door Dwell Times: Comply with A.D.A. formula and provide separate adjustable timers with initial settings as follows:

(1) Main Lobby Hall Call: 5.0 seconds.
(2) Upper Lobby Hall Call: 5.0 seconds
(3) Car Call: 5.0 seconds.
(4) Interruption of Door Protective Device: Reduce the dwell to 1.0 second after all ADA requirements have been met.

f. Leveling: Within 1/4 inch under any loading condition. Level into floor at all times, do not overrun floor and level back.

g. Releveling: Provide smooth and accurate releveling required due to cable stretch.

2. Operating Qualities: Owner's Representative will judge riding qualities of cars and enforce the following requirements. Make all necessary adjustments.

a. Acceleration and Deceleration: Starting and stopping shall be smooth and comfortable, without obvious steps of acceleration. Slowdown, stopping and leveling shall be without jars or bumps. Stopping upon operation of emergency stop switch shall be rapid but not violent.

(1) Vertical Acceleration: Maximum 4 ft. per second squared. Maximum jerk 8 ft. per second cubed.
(2) Horizontal Acceleration: Maximum 15 mg peak-to-peak measured at full speed for full travel in both directions.

b. Full Speed Riding: Free from vibration and sway.

3. Motor Control:

a. Equipment: Capable of operating at plus or minus ten percent of normal feeder voltage and plus or minus three percent of feeder frequency without damage or interruption of elevator service.

b. Control System: Closed loop feedback control incorporating positional and velocity selector system that is capable of operating continuously at contract speed and load for one hour without exceeding 50 degrees Centigrade from ambient machine room temperature. Design system to not adversely affect stability of voltage and frequency controls of emergency generator set or loads connected to emergency power bus during standby power operation.

c. Car Load Sensing:

(1) The control system shall sense the actual load condition of the elevator prior to any movement of the elevators. The start/acceleration pattern shall be adjusted to reflect the carload to achieve a smooth start/acceleration under all load conditions and location in the hoistway.

(2) Provide load-sensing devices that utilize crosshead deflection or hoist rope pressure. System shall be accurate within 100 pounds and stable over extended periods.

(3) Systems using pre-torquing of the D.C. motor armature are acceptable; variable voltage control of the brake energization is not acceptable.

4. Sound Control:

a. Vibration: Sound isolate machines and motor drives from beams and building structure to prevent objectionable noise and vibration transmission to occupied building spaces.

b. Airborne Noise: Maximum acoustical output level of:

(1) 75 dba measured in machine room.
(2) 60 dba measured in elevator cars during all sequences of operation.
(3) 50 dba measured in elevator lobbies.

B. Guide Rails:

1. Size: Standard steel tees with backs machined for splice plates. Extend rails full depth of pits and mounted to continuous pit channels with adjustment bolts to allow for building settlement. Minimum weight in pounds per foot shall be 15 pounds for car and 15 pounds for counterweight.

2. Installation: Drawings indicate basic hoistway framing and special supports for rail brackets. The Elevator Contractor shall provide all additional supports and/or rail backing required. Install plumb within 1/16 inch. File joints smooth.

C. Guide Shoes:

1. Roller Guides: Roller type with rubber composition tires, minimum 3/4 inch wide and fully adjustable spring loaded to provide continuous contact with rail surfaces. Balance car to insure equal guide shoe pressure on all wheels and not exceed manufacturer's recommendations.

a. Size: Nominal roller diameters shall be 6" for car and 3 ¼" for counterweight.

D. Hoist and Governor Ropes: Size and number to insure proper wearing qualities; minimum eight strands wound around hemp core. Pre-formed cables will be permitted. Minimum size: Hoist ropes, 1/2 inch for hoist ropes and 3/8 inch for governor ropes.

E. Buffers: Mount on continuous pit channels with required blocking and supports. For deep walk-in pits, provide platforms with access ladders for servicing car buffers as acceptable to Elevator Code authorities.

1. Spring Type: Proper number and size; tag per code.

2. Oil Type: Oil buffers, spring return type with switches. Pistons shall be fully protected by bluing or canvas covers.

F. Counterweights: Sectional metallic weights securely fastened in structural frame. Frame to be designed to maintain structural integrity without bending upon activation of a seismic force of 0.5 g. Weight shall occupy a minimum of two-thirds the height of the frame.

G. Safeties: Flexible guide clamp type mounted on underside of car frame.

H. Governor: Centrifugal speed type to be located over hoistway in machine room or in pit with protective covering over sheave, jaws and exposed gears. Pit tail sheave frame shall be ratchet or tension type held under 200 pounds tension.

I. Car Frame and Platform:

1. Passenger Elevators: Steel frame with steel or double wood floor; isolate platform from car frame by rubber pads and provided with jacking bolts for pad replacement.

2. Service/Passenger Elevators: Freight type construction with heavy channels front and rear, metal stringers and double wood floor with heavy embossed rubber floor. Design for Class A freight loading. Assume a wheelbase of 24 inches wide by 48 inches long.

J. Traction Machines:

1. General: Provide machines with heavy structural steel bedplates and motors rated for 30 minute with maximum 50 degree Centigrade rise or better.

2. Geared Traction: Provide manufacturer's standard single wrap traction worm-gear machines as approved with 1:1 roping and undercut sheave grooves. Where machines are mounted adjacent to hoistways and where deflector sheaves are required for proper rope deflection, the deflector sheaves shall be an integral part of the machine bedplate.

K. Controller: As standard with approved manufacturer; overload relays in three legs of power circuit and in loop circuit; cabinets with NEMA-1 enclosures and doors arranged with locks or mechanical latches. Provide permanently marked symbols or letters identical to those on wiring diagrams adjacent to each component.

1. The controller wiring shall be carried out in a neat and workmanlike manner in accordance with relevant requirements of National Electric Code.
2. All external connections to the equipment on each controller shall be made by means of approved cable thimbles and/or solderless cable lugs, depending on the current to be carried.
3. Condenser activated or dashpot timers, motors or incandescent globes for dampening acceleration and deceleration steps are unacceptable.
4. Main contactors or starter switches shall be horsepower rated and are not to be mounted directly to the steel cabinets, to ensure quiet operation of controllers.
5. The controllers must be properly shielded from line feeder pollution.

L. Power Conversion and Regulation Unit:

1. All circuitry shall be as approved by the enforcing code. Operation shall be quiet and the performance standards herein specified shall be provided.

2. Design system to control starting and stopping and to prevent damage to motor from overload or excess current and to automatically disconnects power supply. Apply brake and bring car to rest in event of power failure or safety device operation.

3. Controllers shall not have failure modes which results in full power being applied to drive machine operation in event of phase reversal, phase failure or low voltage, which might result in elevator malfunction.

4. Provide system to convert 3 phase, 60 Hz, A.C. building power supply to a fixed D.C. voltage and then invert from D.C. voltage to a variable voltage, variable frequency, distortion-free, smooth A.C. current output to the A.C. hoist motor.

5. Varying the frequency input to the motor shall control motor speed; varying the voltage to the motor shall control torque.

6. System shall be provided with necessary devices to insure quiet operation not exceeding noise level specified in "Design Criteria" and to protect building system power line against line voltage transients.

M. Machine Beams and Sheaves: Provide all structural steel machine and sheave beams with dead end hitch plates, bearing plates, anchors and blocking as required to support equipment. Secondary, overhead and deflecting sheaves with roller bearings and means for lubricating bearings from machine rooms as required where secondary levels are not provided.

N. Selector: The system shall utilize a device to establish incremental car position to an accuracy of 0.1875 inches or better using quadrature signal for the entire length of the hoistway. Absolute floor number encoding with parity shall be provided at each floor in order to establish exact floor position to the computer. The system shall not require movement to a terminal landing for the purpose of finding the correct car position.

1. The system shall utilize an automatic two-way leveling device to control the leveling of the car to within 1/4 inch above or below the landing sill. Over travel, under travel, or rope stretch must be compensated and the car brought level to the landing sill.

2. The individual car controller shall be capable of learning the position of each floor in the building to an accuracy of 0.1875 inches.

3. The individual car controller shall have the software program that uses mathematical methods to create an idealized optimum velocity profile of the car travel from any floor to any other floor providing a smooth and stepless elevator ride. All the system motion parameters (such as jerk, acceleration, deceleration rates etc.) shall be field programmable with parametric limitations for the system dynamics, and be stored on EPROM as non-volatile memory.

4. The drive control system shall utilize the optimized velocity profile in a dual-loop feedback system based on car position and speed. A velocity feedback device shall permit continuous comparison of car speed with the calculated velocity profile to provide accurate control of the acceleration and deceleration, right to the final stop without discomfort, regardless of direction of travel or load in the car.

5. The individual car controller shall have an independent safety processor that monitors the speed of the car and creates a phantom speed contour near the terminal landing, so that the car would not be capable of traveling faster than the phantom speed contour. This processor should work independently of any other logic or motion control processors in the system.

6. The controller shall utilize a solid-state drive unit using solid-state power devices to control the motor field and machine brake.

7. The controller shall provide the required electrical operation of the elevator control system including the automatic application of the brake, which shall bring the car to rest upon failure of power.

8. In addition, the power control shall be arranged to continuously monitor the actual elevator speed signal from the velocity transducer and to compare it with intended speed signal to verify proper and safe operation of the elevator.

O. During operation of the elevator with overhauling load (empty car up or loaded car down), precision speed control shall be obtained by the regulation system utilized in the power control. The automatic leveling zone shall not extend more than 12 inches above or below the landing level nor shall the doors begin to open until the car is within 12 inches of the landing. In addition, the inner leveling zone shall extend not more than 3 inches above or below the landing. The car shall not move if it stops outside the inner leveling zone unless the doors are fully closed.

1. An electro-mechanical switch shall open all power feed lines to the brake. A single ground, short circuit, or solid-state control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing are not acceptable.

2. A motor field current sensing means shall be provided which shall cause electric power to be removed from the armature and brake unless the direct current flowing in the shunt field of the motor is sufficient to prevent over speeding of the motor.

P. Compensation:

1. Chain Type: Encapsulated chain equal to Quiet Link, Whisperflex, or equal with pivoted compensating sheave having a nominal diameter of 25 inches to maintain loop, limit horizontal movement and prevent rubbing of chain on elevator equipment or hoistway items.

PART 3 - EXECUTION

3.01 GENERAL:

A. Bidding Documents: Bidders shall examine architectural, structural, electrical and mechanical plans and specifications. Any discrepancies which affect the elevator work or conditions adverse to the bidder's equipment shall be brought to Owner's Representative's attention at least seven (7) days prior to the bid date. If no discrepancies are presented, changes required to accommodate bidders equipment become the responsibility and cost of the Elevator Contractor.

3.02 PREPARATION:

A. Field Measurements: Field-verify dimensions before proceeding with the work. Coordinate related work by other trades. Verify the following to be acceptable for installation of elevators.

1. Hoistway has been correctly sized and otherwise properly prepared.
2. Equipment supports are satisfactory.
3. Electrical rough-ins are correct.
4. Do not begin installation until unsatisfactory conditions have been corrected.

3.03 INSTALLATION:

A. General: Install per manufacturer's requirements, those of regulatory agencies and as specified.

B. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustments, inspection, maintenance and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturer.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails, for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe workable dimensions at each landing.

F. Erect guide rails plumb and parallel with maximum deviation of 1/16 inch. Anchorage of guide rails shall not compromise waterproofing. Do not bottom rails on pit floor.

G. Grout sills with non-staining, non-shrink grout. Set units accurately aligned with finished floor at landings.

H. Graphics: Provide graphics visible to public as selected by Owner's Representative.

I. Manufacturer's Nameplates: Manufacturer's nameplates, trademarks or logos not permitted on surfaces visible to public.

3.04 TEMPORARY ELEVATOR USE DURING CONSTRUCTION:

A. General: Should the General Contractor require the use of any elevator during construction, Contractor shall make arrangements directly with the Elevator Contractor, coordinate temporary facilities and pay all costs associated with the protection, operation and use of elevators.

B. Maintenance: Elevators shall be maintained on a regular basis during the temporary construction use. A minimum of two hours per week per elevator shall be spent on examination, lubrication, adjusting and cleaning the elevator equipment.

C. Damage: The Owner is entitled to receive new elevator equipment upon final acceptance of the entire project. The Owner's representative will thoroughly examine all elevator equipment upon completion of temporary use and provide a punch-list outlining items that must be repaired or replaced to ensure the equipment is in new condition. Final acceptance and payment will not be made until all items have been satisfactorily completed.

D. Schedule: Sufficient time must be allowed to prepare and adjust temporary elevators so that the entire elevator installation is ready for final acceptance.

3.05 TEMPORARY ACCEPTANCE AND USE BY OWNER:

A. When an elevator is near completion and declared ready for service, before completion of other elevators, Owner agrees to accept elevator and place it into automatic service.
B. The elevator must be tested and inspected by regulatory agencies and a permit to operate issued.
C. A walk-through examination will be performed in the presence of the Owner's Representative, General Contractor and Elevator Contractor to determine present condition of elevator.
D. The Owner agrees to sign or cause the General Contractor to sign a temporary acceptance form that is mutually agreeable to all parties.
E. During this temporary acceptance period, the Owner agrees to pay or cause the General Contractor to pay an agreed amount per day per elevator for regular maintenance. The cost for this maintenance per elevator, per day, shall be stated in the Elevator Contractor's bid.
F. The warranty and full maintenance period will be effective upon final acceptance of the entire installation.

3.06 FIELD QUALITY CONTROL:

A. Regulatory Agencies Inspection: Upon completion of elevators, Contractor shall provide instruments, weights and personnel to conduct test required by regulatory agencies. The Contractor shall submit a complete report describing the results of the tests.

B. Examination and Testing: When installation is ready for final acceptance, notify and assist Owner's Representative in making a walk-through review of entire installation to assure workmanship and equipment complies with contract documents. Provide equipment to perform the following tests:

1. One-hour heat and run test with full load in car. Perform for one car of each duty.

    a. Stop car at each floor in each direction.
    b. Provide well-shielded thermometers for motor and verify that temperatures do not exceed 50 degrees Centigrade above ambient.
    c. Performance and leveling tests shall be made before and after heat and run test.

2. Check and verify operation of all safety features and special operations.

    a. Measure horizontal acceleration.
    b. Measure acoustical output levels in machine room, lobbies and cars.
    c. Measure voltage transients and harmonics feedback into building electrical system.

C. Correction: Make corrections to defects or discrepancies at no cost to Owner. Should discrepancies be such that re-examination and retesting is required, the Elevator Contractor shall pay for all costs including those of Owner's representative fees.

D. Final Acceptance: Final acceptance of the installation will be made only after all corrections are complete, final submittals and certificates received and the Owner is satisfied and the installation is complete in all respects. Final payment will not be made until the above is completed.

3.07 INSTRUCTIONS: Instruct Owner's personnel in proper use of each system.

3.08 MAINTENANCE:

A. General: Provide complete continuing maintenance on entire elevator equipment during regular working hours on regular working days for a period of 12 months after filing Notice of Completion.

B. Examination: Include systematic examination, adjustment, and lubrication of elevator equipment whenever required and replacement of defective parts with parts of same manufacture as required for proper operation. Contractor not responsible for repairs to car enclosures, door panels, frames, sills or platform flooring resulting from normal usage or misuse, accidents and negligence for which Contractor is not responsible. Examinations shall be performed twice monthly expending a minimum of one and one-half hour per unit per visit performing preventative maintenance service.

C. Performance Standards:

1. Maintain the performance standard set forth in this Specification and maintain correct operation of the dispatching system.
2. Maintain smooth starting and stopping, smooth riding qualities and accurate leveling at all times.

D. Callbacks: In event of failures, provide 24-hour callback service at no additional cost to Owner.

E. Elevator Shutdowns:

1. Should any elevator become inoperative, repair within 24 hours of the notification of such failure. Breakdown of major components shall be completed and service restored within 72 hours.
2. Failure to comply with above, Owner may order the work done by other contractors at the Contractor's expense.
3. Devices repaired or replaced by others shall, nevertheless, be provided with maintenance by the Contractor who shall become completely responsible for correct operation of such devices for lifetime of this contract.

F. Follow-Up Tests: Test all safety devices and emergency operations at six (6) month intervals or oftener and submit written report on each test. Make tests at times which do not interfere with building operation.

G. Maintenance Materials:

1. Expendable Parts: The Elevator Contractor shall provide a metal cabinet in at least one machine room on project premises containing the following expendable parts required for prompt replacement. Parts used for

routine maintenance shall be replenished and stored in machine room to ensure an adequate supply is available. Parts and cabinet shall become Owner's property and not removed upon expiration of maintenance period.

a. One set starter contacts and coils.
b. Two resistors of each type installed.
c. One set hanger sheaves for car and hoistway doors.
d. Two relays and relay bases of each type installed.
e. Twenty-four lamps of each type installed.
f. Car and hall buttons with identical graphics installed; six for manufacturer's standard buttons, one of each type for special buttons.
g. Twelve fuses of each type installed.
h. One set motor brushes of each type installed.
i. Any other parts required for prompt replacement.
j. Lubricants and cleaners of all types used for maintenance.

2. Replacement Parts: Keep the following parts in a warehouse within 50 miles of the project premises.

a. One door operator motor of each type used.
b. Transformers of each type installed.
c. Two complete door interlocks.
d. Parts for motor drive units.
e. Parts for door protective devices.
f. One set of packing for each size cylinder.
g. Such other parts as are needed to insure prompt replacement in event of elevator shutdown such as spare control boards for computer-operated systems.

H. Maintenance Data: After completion and prior to final acceptance, submit three sets of complete and accurate maintenance data specific for each elevator. Final payment will not be made until received.

1. Manuals: Describe proper use and maintenance of equipment, lubrication points, types of lubricants used and frequency of lubricant application.

2. Parts Catalogs: Complete listing of all parts of equipment and components used in the installation.

3. Wiring Diagrams: One laminated set mounted in machine room, one reproducible mylar set and one blue line set delivered to Owner. Wiring diagrams shall be as built, specific for this installation, and reference identification on drawings shall match points identified on terminals of controllers.

4. Maintenance Tool and Software Manuals: Provide maintenance tools and supporting software documentation required for the complete maintenance of the entire system including diagnostics ad adjusting. Maintenance tool may be hand held or built into control system and shall be of the type not requiring recharging or reprogramming nor of the automatic destruct type. The tool and supporting software may be programmed to operate only with this project's identification serial numbering.

5. Final Service and Inspection: Two weeks before expiration of the year's maintenance, the equipment shall be lubricated, fully serviced, adjusted to the standards designated and emergency service operation devices shall be checked. A representative of the Owner will make a complete inspection.

I. Quotation: Base bid shall include cost of maintenance and materials as described above.

END OF SECTION

SECTION 15010

MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Section 15010 applies to all other Sections of Division 15 unless otherwise specified. The Work of this Section includes labor, materials, equipment and services necessary for complete, safe installation in conformity with applicable codes and authorities having jurisdiction.

A. Work In Division 15: Principal items include:

15010	Mechanical General Provisions.
15042	Air and Water Test and Balance.
15047	Identification.
15050	Mechanical Basic Materials and Methods.
15160	Vibration Isolation and Seismic Restraints.
15180	Mechanical Insulation.
15300	Fire Sprinkler Systems.
15402	Domestic Water Systems.
15414	Drainage Systems.
15430	Plumbing Specialties.
15450	Plumbing Fixtures.
15513	Boilers
15620	Coils
15640	Packaged Cooling Towers.
15650	Water Treatment.
15700	Wet Heat Transfer.
15800	Air Moving Equipment.
15840	Ductwork.
15848	Duct and Plenum Lining.
15900	Building Automation System.

B. Related Work Not In This Section: Consult all other Divisions, determine the extent and character of related Work; coordinate Work specified herein with that specified elsewhere.

C. Definitions:

1. "Piping": Pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.
2. "Wiring": Raceway, fittings, wire boxes and related items.
3. "Concealed": Embedded in masonry or other construction, installed in furred spaces, in couple partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures.
4. "Exposed": Not installed underground or "concealed" as defined above.
5. "Motor controllers": Manual or magnetic starters (with or without switches) individual pushbuttons or hand-off automatic (HOA) switches controlling the operation of motors.
6. "Control devices": Automatic sensing and switching devices such as thermostats, pressure flat, electro-pneumatic switches and electrodes controlling operation of equipment.
7. "Unfinished space": A room or space that is ordinarily accessible only to building maintenance personnel. A room that in the Architect's finish schedule has exposed and unpainted construction for walls, floor, and ceiling. Any room specifically mentioned as "Unfinished".
8. "Finished space": Room or space not unfinished as described above. Any space ordinarily visible to the visiting public, including exterior spaces.
9. "This Division": Mechanical Division 15 of the Project Manual; a portion of the Project Manual that includes all the Sections of the Specification Sections listed under Article 1.01, Summary.

10. "Individual Mechanical Section": Any one of Sections listed under Article 1.01, Summary.
11. "Other Divisions": Portions of Specifications that does not include the Mechanical Division.
12. "Riser": Vertical pipe or duct having a vertical length greater than one story height.
13. "Drop": A vertical pipe or duct that does not penetrate a floor.
14. "Upfeed connection": A vertical pipe or duct that penetrated a floor, but has a vertical length of less than one story height.
15. "Header": Any pipe or duct of constant size that serves a battery of closely spaced inlet or outlet connections.

1.02 SUBMITTALS: Refer to Section 01330 Submittals for basic requirements and procedures. Refer to the individual Sections of Division 15 for the submittals required.

A. Deviations: If the equipment submitted under Division 15 requires changes in material or labor from that required in the Contract Documents, such changes shall be submitted as Shop Drawings in accordance with the Section 01330.

B. Approved Changes: Any approved changes in the piping, wiring, controls, or installation procedures required by the equipment manufacturer shall be made at no additional cost to the Owner, and with no reduction in scope.

C. Product and Equipment Data: Submit a complete list of material and equipment proposed for the Work, including manufacturers' names, even if they are as specified or shown on Drawings. Reference listings to the Specification Section and Article to which each is applicable. Include complete catalog information such as construction, ratings, and performance curves as applicable.

D. Certificates: For materials specified to meet UL, FM, or trade standards, furnish manufacturer's or vendor's certification material furnished for the Work does, in fact, equal or exceed requirements specified.

E. Shop Drawings: Conform to Section 01330. Submit in complete groups of materials and, in addition to the Contractor's review and approval required in Section 01330, each item of material submitted shall be initialed by Contractor as verification that submittal has been reviewed in detail and is in fact the Contractor's choice of materials. The Contractor shall verify the dimensions of equipment and be satisfied as to Code compliance for fit before submitting Shop Drawings. Departure from above procedure will result in re-submittal and delays. Include all information required by Division 15 Sections.

F. Contractor's Certification: Add and sign following paragraph on equipment and materials submitted for review; failure to add the following statement will result in delay of the review of submittal:

> "It is hereby certified the (equipment)(material) shown and marked in this submittal is that proposed to be incorporated into the Project; is in compliance with the Contract Drawings and Project Manual; can be installed in the allocated spaces."

G. Deviations from Contract Documents:

1. Substitution: Refer to Section 01630. Submittals which are intended to be reviewed as a proposed substitution, variation, or departure from Contract Documents, shall be submitted to the Architect not later than ten calendar days before date set for opening bids.

2. Deviations: If Shop Drawings show deviations from Contract Document requirements because of standard shop practice, or other reasons, make specific mention of deviations in the transmittal letter to the Architect, as well as encircle deviations on Shop Drawings to identify and call them to the Architect's attention as required in Section 01330. Unless Contractor has notified Architect of proposed variations, deviations, or omissions and received approval thereof, Contractor is required at its sole expense to repair, replace, provide whatever materials are required, and perform all approved Work necessary to rectify such deviations and variations as directed by the Architect at time such variations, deviations, or omissions are discovered, even

though this does not occur until after the Shop Drawings have been reviewed and Work in question has been completed. Repair and replacement shall be mandatory in such instances and shall be performed at no cost to the Owner.

H. Equipment Ordering: Be responsible for equipment ordered and/or installed prior to the receipt of approved Shop Drawings and other related submittals returned from Architect. Corrections or modifications to equipment as noted on Shop Drawings shall be performed or equipment removed from the Job Site as request of the Architect without additional compensation to Contractor.

I. Manuals: Coordinate with and conform to Section 01770, Closeout Procedures and Submittals; supplement only with the items not specified therein. Compile the Manual from information supplied by equipment manufacturers and from test and balance data furnished.

1. Contents: Each Manual shall contain:

   a. Complete instructions on the operation of all mechanical equipment, including all control settings, switch positions, timer operation, etc.
   b. Complete instructions regarding maintenance of all mechanical equipment including periods and frequencies of all inspections, lubrications and filter replacement, etc.; type of lubricants required; and exact description of performance of such maintenance and full description of inspections and corrections to make a step-by-step basis.
   c. Copy all control and wiring diagrams.
   d. Complete nomenclature of all replaceable parts, their part numbers, and name, address, and phone number of the nearest vendor.
   e. Copy of the test and balance report.
   f. A complete index at the front furnishing immediate information as to location in the manual of all data regarding the installation. Numbered tab sheets shall be used.

J. Record Documents: Prepare and submit in accordance with Section 01770, Closeout Procedures and Submittals. With Record Drawings include Record Project Manual for all Sections of Division 15. On Record Drawings, locate buried service piping and indicated future connections outside of buildings both by depth and by accurate measurement from permanent landmarks of buildings both by depth and by accurate measurement from permanent landmarks such as a building or structure.

K. Training: Provide training to the Owner's representatives for all operating and routine maintenance procedures. Duration of the training shall be no less than 40 hours. Submit video taping of the training session as part of the closeout documents.

1.03 QUALITY ASSURANCE:

A. Code Compliance: All Work performed under Division 15 must comply with the latest edition of all applicable codes and requirements including but not limited to:

1. California Code of Regulations - titles as applicable.
2. California Building Code 2001.
3. California Mechanical Code 2001.
4. California Plumbing Code 2001.
5. City of Los Angeles Department of Public Works Requirements.
6. Title 24, Part II State Building Code.
7. State of California Regional Water Quality Control Board Requirements.
8. Factory Mutual Requirements.

B. Minimum Requirements: The requirements of the Drawings and specified are the minimum that will be allowed under this Section.

C. Permits, Fees, Licenses, and Inspections

1. Permits and Fees: Refer to Conditions of the Contract. Obtain and pay permits and fees for all Sections of Division 15. Prior to bidding verify, with the serving utilities, that the services as indicated and/or specified are correct. Bids shall include any excess charges and other utilities service costs not borne by serving utilities, and required to complete the service installations indicated and/or specified.

2. Inspections: All Work of Division 15 shall be regularly inspected and certificates of approval shall be delivered to the Architect.

3. Permit to Operate: Obtain and pay for a State Industrial Accident "Permit to Operate" for each pressure vessel.

D. Mechanical Work Superintendent: Furnish the services of a superintendent experienced in the Work of each Section of Work under Division 15 who shall be constantly in charge of the progress of the Work of Division 15, together with all necessary journeymen, helpers, and laborers required to properly unload, erect, connect, adjust, start, operate, and test the Division 15 Work involved.

1.04 PROJECT CONDITIONS

A. Drawings:

1. Diagrammatic Drawings: For purposes of clearness and legibility, the Drawings are essentially diagrammatic and, although size and location of equipment is drawn to scale, make use of all data in all of the Contract Documents, and verify this information at building site.

2. Routing of Ducts and Piping: The Drawings indicate required size and termination of pipes and ducts and suggest proper routes of piping and duct to conform to the structure, to avoid obstructions, and to preserve clearance. It is not the intent to indicate all necessary offsets and it shall be the responsibility under Division 16 to install ductwork and piping in such a manner as to conform to the structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and make all equipment requiring inspection, maintenance, and repair accessible without further instructions or extra cost to the Owner.

B. Coordination with Other Trades:

1. Check with other Sections of the Project Manual so that no interference shall occur and in order that grade lines may be established for the work.
2. Installed work which interferes with the work of other trades shall be satisfactorily removed and rerouted.
3. No extra payments will be allowed for changes made necessary by interference with the work of other trades. Contractor shall be aware of ceiling heights of different areas in building.

C. Damage Responsibility: Under Division 15, Contractor is responsible for damage by its own negligence to the grounds, or equipment, and the loss of refrigerants or fuels caused by leaks or breaks in any pipes or equipment provided under Division 15.

1.05 WARRANTY: Conform to Section 01790. The Contractor shall unconditionally warranty materials, equipment, and labor furnished and installed under Division 15 for a period of one year from the date of substantial completion as defined in Conditions of the Contract. The standard warranty of the manufacturers shall apply for replacement of parts after expiration of other warranty periods stated herein if they are for shorter time than the manufacturer's standard warranty. Manufacturer shall furnish and replace parts to the Owner. Deliver to Architect printed manufacturers' warranties complete with material included and expiration dates upon completion of the Work in accordance with Section 01790.

PART 2 - PRODUCTS

2.01 MATERIALS: Products, materials, and equipment shall be as specified in pertinent Sections of Division 15 of the Project Manual. All materials and equipment shall be new and free from defects. Wherever possible, all materials and equipment used in the installation of Work of Division 15 shall be of the same brand or manufacture for each class of material or equipment.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILL: Do excavation and backfill required to install the Work of Division 15 inside and outside of building except as shown otherwise. Perform excavation and backfilling in accordance with requirements specified in Division 2. Do not backfill until after final inspection and approval of the piping installation by all legally constituted authorities and complete recording of buried piping and systems on Field Record Set of the Record Drawings. Backfill material shall be as specified under pertinent Sections.

3.02 PROTECTION, CARE, AND CLEANING:

A. Protection: Provide adequate means for, and fully protect, all finished parts of the materials and equipment against physical damage from whatever cause during the progress of this Work and until final completion.

B. Care: During construction, properly cap all lines and equipment nozzles so as to prevent the entrance of sand and dirt. Protect equipment against moisture, plaster, cement, paint, or Work of other trades covering it with polyethylene sheets.

C. Cleaning: After insulation has been completed, clean all systems as follows:

1. Ductwork, Piping and Equipment to be Insulated: Clean exterior thoroughly to remove rust, plaster, cement, and dirt before insulation is applied.

2. Ductwork, Piping, and Equipment to be Painted: Clean exterior of piping and equipment exposed in completed structure, removing rust, plaster, cement, and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable solvents.

3. Motors, Pumps, and Other Items with Factory Finish: Remove grease and oil, and leave surfaces clean and polished.

3.03 LUBRICATION: Upon completion of the Work and before turning over to the Owner, clean and lubricate all bearings except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacture and as listed in the Manual. Maintain lubrication of all mechanical equipment under the Contract until Work is accepted by the Owner.

3.04 PAINTING: All finish painting of mechanical equipment shall be performed under Section 09900 - Painting, unless equipment is herein specified to be provided with factory applied finish coats. All equipment shall be provided with factory applied prime finish, unless otherwise specified. Mark the purpose, size, and direction of flow and have the correct labels stenciled on pipe.

A. Touch-up: If the factory finish on any equipment is damaged in shipment or during construction of the Work, the equipment shall be refinished to the satisfaction of the Owner. One can of touch-up paint shall be provided for each different color factory finish which is to be the final finished surface of the product.

B. Concealed Equipment: All uncoated cast iron or steel that will be concealed, or will not be accessible when installations are completed, shall be given one heavy coat of black asphaltum before installation and/or concealment.

3.05 CUTTING AND PATCHING:

A. Sleeves and Inserts: Provide all sleeves, inserts, and openings necessary for the installation of Work of Division 15.

B. Openings: Special forming, recesses, chases, and curbs, as necessary for the proper reception and installation of the mechanical equipment, as indicated, shall be provided in the structure under other Divisions. Examine all Drawings to ascertain proper provisions have been made for Work of Division 15. If such provisions are not made in time, bear extra costs incurred in later cutting and patching to accommodate this Work.

3.06 CONCRETE WORK: Provide all concrete required under Division 15. Size of housekeeping pads and isolation bases shall be 4" high, extending 6" beyond area of equipment. Furnish all required dimensional drawings for bases and pads and location thereof. Furnish embedded anchor bolts and sleeving and verify installation of same.

3.07 MAINTENANCE MATERIALS AND TOOLS: Conform to Section 01770. Spare parts shall be furnished to Owner as specified or ordered and receipts obtained and included with Manuals. If any part of the equipment furnished under Division 15 requires a special tool for assembly, adjustment, setting, or maintenance thereof and such tool is not readily available on the commercial tool market, the tool shall be delivered to the Owner in accordance with Section 01770.

3.08 COMMISSIONING:

A. General: Before acceptance tests are performed, the Contractor shall demonstrate to the Owner that all systems and components are complete and fully charged with operating fluid and lubricants. The Systems shall be operable and capable of maintaining continuous uninterrupted operational service during the operating and demonstration periods of operation. All control systems shall be completely operable with calibration and setting properly set and adjusted. All rotating equipment shall be in dynamic balance and alignment as specified by the manufacturer.

B. Tests: Pressure tests shall be performed as specified in Section 15042, Air and Water Test and Balance. After systems have been completely installed, connections made and tests completed, Contractor shall make arrangements with the Owner to operate the systems for a period of five working days during the hours of a normal working day. The Contractor shall notify the Owner in writing when the operational period may start and the time for this period shall be scheduled by mutual agreement. During this operational test, instruct the Owner's operating personnel. Perform testing as specified and as required by the Architect to prove installation is in accordance with Contract requirements. Perform tests in presence of the Architect or the Architect's representative, and furnish test equipment, facilities, and technical personnel required to perform tests.

3.09 SYSTEM ACCEPTANCE:

A. Final Review: Prior to system acceptance after:

1. Completion of the installation of all Division 15 Work required under the Contract Documents.
2. Submission and approval of Manuals, Record Documents, and warranties.
3. Completion of identification program.
4. Completion of cleaning program.
5. Satisfactory operation of all systems for a period of one week.

B. Acceptance: Contingent upon completion of final review and correction of all deficiencies; satisfactory completion of acceptance tests which demonstrate compliance with performance and technical requirements of the Contract Documents; and satisfactory completion of the training program and submissions of all Manuals and Drawings required by the Contract Documents.

END OF SECTION

SECTION 15042

AIR & WATER TEST & BALANCE

PART 1 - GENERAL

1.01 SUMMARY: Division 1 and Section 15010 apply to this Section. Perform all air and water test and balance, complete.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products and material specified in this Section including, but not limited to, the following:

1. Air flow measuring devices.
2. Pressure gauges.
3. Thermometers.
4. Other testing instruments.
5. Certificates of calibration of test instruments.

B. Sample Forms: Submit complete forms proposed for use in compiling and recording test and balance data.

PART 2 - PRODUCTS

2.01 PRODUCTS AND MATERIALS: As specified in pertinent Division 15 Sections.

PART 3 - EXECUTION

3.01 REQUIREMENTS:

A. General:

1. Notify the Architect when any test is ready to be performed. Architect or Architect's representative shall be present for all tests.
2. Equipment required for testing, including fittings for additional openings, shall be furnished under this Section. Provide all openings inside and outside the building as required.
3. After the inspection has been approved, or portions thereof, certify in writing the time, date, name and title of the person approving the test. This shall also include the description and what portion of the system has been approved. The person making the inspection shall sign the certification.
4. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job site to all authorities concerned.
5. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Architect.
6. Defective work or material shall be replaced or repaired at no extra cost to Owner, as necessary, and the inspection and test repeated. Repairs shall be made with new materials. No caulking of screwed joints or holes will be acceptable.
7. No part of any work shall be covered or concealed until after it is inspected, tested and approved.
8. Isolate all equipment subject to damage from test pressure. Make no test against a service valve or meter.

B. Timing of Tests: Two (2) weeks before expected completion date, put all systems and equipment into operation of same during each working day, but not less than five 8-hour periods, until all adjusting, balancing, and testing demonstrations required have been approved.

C. Operational Tests: All bearings of all equipment shall be oiled or greased as recommended by the manufacturer, after installation. Perform operational tests on all machinery and devices to determine compliance with requirements specified. Equipment shall function quietly and efficiently. Repair or correct undue noise or vibration caused by piping and equipment before acceptance.

D. Functional Tests: Any installed item not meeting the schedule or specified performance shall be removed and replaced with items whose performance is in accordance with the Drawings and Project Manual at no additional cost to the Owner.

3.02 PIPING PRESSURE TEST:

A. Domestic, Condenser, and Hot Water Distribution: Test the system with water at a hydrostatic pressure of not less than 150 psi. Provide pressure gauge located at the highest point of the system being tested, with a shut-off valve and bleeder valve so arranged to check gauge operation. The test shall be applied not less than one (1) hour prior to inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately as specified for the entire system. There shall be no drop in pressure at the end of four (4) hours with pressurization source disconnected.

B. Drainage, Vent, and Storm Systems: Water test shall be applied to the system either in its entirety or in sections to maintain reasonable test pressures. The piping shall be tightly plugged and submitted to a 10-foot head of water located at the highest point. Provide a separate standpipe above the highest point being tested or extend the system to obtain the required 10-foot head of water. The water shall be kept for at least 30 minutes before the inspection starts. System shall hold water four (4) hours without loss.

C. Fire Protection System: Testing shall be as specified in Section 15500, Fire Protection Systems.

D. Sectionalizing: Parts of systems may be isolated for the purpose of testing. Each isolated part shall be specifically identified and certified.

3.03 AIR AND WATER BALANCE:

A. General: The balancing and testing shall be performed by a firm specializing in balancing and testing or, if approved, the Contractor's forces as reviewed by the Architect. Air and water systems shall be balanced in accordance with standards and procedures of ASHRAE. Use instruments accurately calibrated and maintained in good working order. If requested, conduct tests in the presence of the Architect.

B. Balancing and Adjusting Air Systems:

1. Procedure: After completion of systems or of a complete tenant space.

   a. Adjust grilles, registers, and diffusers for optimum air distribution and minimum noise and drafts, starting with all elements in wide open position.
   b. Adjust all fan speeds and manually operated dampers to supply, exhaust and/or return the quantities of air specified to +5%, -0%.
   c. In cooperation with control manufacturer's representative set adjustments of all automatically operated dampers to operate as specified, and/or shown. Make all required tests associated with damper adjustments.
   d. Make any changes in pulleys and belts as necessary for correct balance and noise levels at no additional cost to the Owner.
   e. If any additional apparatus, devices or equipment is required to balance the systems, such apparatus, devices or equipment shall be included in the work at no extra cost to the Owner.
   f. Zone boxes; record and adjust maximum and minimum flow.
   g. Calibrate zone thermostats.

2. Test: Perform the following tests, compile information, and submit copies of this information for evaluation by the Architect. Submit in report form with suitable 3-ring binder cover.

3. Air Handling Equipment:

   a. Make, size, model number, designation and location of all fans and units containing fans.
   b. Motor size, voltage, phase, rated and actual current readings for above equipment.
   c. Air handled in CFM (remove duct sections as required to operate fans).
   d. Outlet velocities in FPM.
   e. Inlet, outlet and total static pressure of each unit.
   f. Re-circulated and outside air quantities, if applicable.
   g. Fan speed.
   h. Motor pulley sizes and speeds.

4. Diffusers, Grilles, and Registers:

   a. Location, size, make, model number, and total free area of each, or manufacturer's air flow factors.
   b. Required and test resultant velocity in FPM of each.
   c. Required and test resultant quantity of air in CFM of each.

C. Balancing and Adjusting of Water Systems:

1. Procedure:

a. Check for proper operation and setting of valves, strainers rotations, air vents, and control valves.
b. Set all temperature controls so all coils are calling for full cooling or full heating.
c. Set condenser and hot water pumps to proper gallons per minute delivery.
d. Check water temperature at inlet side of cooling coils. Note rise or drop of temperature from source.
e. Measure and adjust flow at each chilled water coil.
f. Upon completion of flow readings and adjustments at coils, mark all settings and record the data.
g. Trim pump impellers on constant speed pumps to eliminate any need to throttle discharge or inlet valves.

2. Records: Record and check the following items:

a. Temperature of inlet medium.
b. Temperature of leaving medium.
c. Pressure drop of each coil.
d. Pressure drop across flow control device.
e. Pump operating suction and discharge pressure and final TDH.
f. Rated and actual running amperage of pump motor.

D. Reports: Upon completion, insert all information on a sheet listing all items specified as required on approved forms and include in test and balance report. Type all sheets.

END OF SECTION

SECTION 15047

IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY: Division 1 and Section 15010 apply to this Section. Provide identification, complete, as indicated, specified, or required.

A. Related Work Not In This Section:

1. Basic Mechanical Materials and Methods: Section 15050.
2. Domestic Water System: Section 15402.
3. Drainage System: Section 15414.
4. Fire Protection System: Section 15500.
5. Self-contained Air Conditioning Unit: Section 15770.
6. Air Moving Equipment: Section 15800.
7. Ductwork: Section 15840.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products and material specified in this Section including, but not limited to, the following:

1. Valve tags.
2. Apparatus identification.
3. Labels.

PART 2 - PRODUCTS

2.01 VALVE TAGS: Tags for plumbing service valves shall be 2" diameter brass or aluminum. Numbers and lettering identifying valve number and service or stamped or a combination.

2.02 APPARATUS IDENTIFICATION: Apparatus nameplates shall be black lamacoid plates with white lettering engraved through the black layer. Equipment identification shall be embossed aluminum or engraved plastic plate securely attached to equipment.

2.03 PIPE IDENTIFICATION: Piping markers shall be Brady vinyl cloth B-500.

PART 3 - EXECUTION

3.01 GENERAL: All valves shall have an identification tag identifying valve number and service. Secure tags to valves with plated No. 18 gauge jack chain. Valves that are equipped with chain operators shall have an additional tag secured to the hook or clip that supports the swagged chain.

3.02 APPARATUS IDENTIFICATION: Nameplates shall be for the following types of apparatus: Starters, disconnects and switches provided under the Work of Division 15.

3.03 EQUIPMENT IDENTIFICATION:

A. Identification shall be provided for the following types of equipment:

1. Damper motors (not terminal boxes).
2. Automatic valves.
3. Flow switches.
4. Pressure switches.
5. Fans.
6. Filter banks.

B. Equipment out of view behind doors in unfinished rooms shall also be identified on the face of the access door.

3.04 VALVE IDENTIFICATION:

A. Provide identification for all valves and devices as follows:

1. Valves in equipment rooms.
2. Shutoff valves in all piping.
3. Control valves.
4. Safety devices.
5. Keys for enclosures.

B. Description: Tags shall be constructed of brass and attached to the valves and devices with brass chain and "S" hooks. Letters shall be 3/8" high indicating the type of service and valve number.

C. Schedule: Tag schedules shall be typed, laminated in plastic, and included in service manuals turned over to the Architect. The schedule shall include the type of service, location by floor level, and location by room name.

3.05 PIPE IDENTIFICATION: All exposed and above ceiling piping whether insulated or not shall be identified by content, size of pipe, and the direction of flow indicated by means of Brady Pipe Markers and flow arrows. Brady identifying markers shall be installed near all valves on each piping system.

A. Furred Spaces: Piping installed in furred spaces will not require identification except at valve access panels where valves and piping shall be identified.

B. Location: Piping identification stencils shall be located so as to be readily visible form any reasonable point of observation. Where two (2) or more pipes run parallel, the printed legend and other markers shall be applied in the same relative location. All identification at eye level, shall be along center line of pipe, above eye level on the lower quarter of pipe and below eye level on the upper quarter of pipes.

C. Lettering: All lettering shall be 3/4" high and shall be black except where background is black, in which case white or aluminum shall be used.

D. Painting and Stencils: Shall be under the Work of Division 9 Painting. The Work of this Section includes the following:

1. All markers.
2. Supervision of painting.
3. Location and type of markings required.

E. Symbols for Identification: Shall be as scheduled.

F. Ceiling Markers: Markers are provided under Section 09510 - Acoustical Ceilings. In areas where removable acoustical tile ceilings occur, install appropriate ceiling tile markers to indicate location of valves and other equipment. Refer to Architectural Drawings and Sections for the type of tile marker and color code for each trade.

G. Stencils: Fabricate stencils and turn over to the Owner at completion of the Work.

H. Flow Arrows: Are required.

3.06 IDENTIFICATION CHARTS:

A. General: All piping systems, controls, valves, apparatus, etc., shall be permanently identified.

B. Valve Charts: Prepare charts and diagrams for each piping system, indicating by identifying letter or number each valve in the system, valve's location and function.

C. Piping Charts: Prepare charts for piping systems in accordance with the pipe identification schedule.

D. Mounting of Charts: Mount one of each chart in aluminum frame with clear glass front, and secure one to wall as designated by the Owner.

E. Binding of Charts: Bind copies of each chart in Operating and Maintenance Manual. See Section 15010.

END OF SECTION

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 and Section 15010 apply to this Section. Provide basic mechanical materials and methods, complete.

A. Work In This Section: Principal items include:

1. Construction, installation, materials and equipment specified herein are generally common to the various Sections of Division 15 as listed in Section 15010, Mechanical General Provisions.
2. Refer to individual Mechanical Sections for the piping schedule required for each particular piping system.
3. Refer to Approved Manufacturers List herein for acceptable manufacturers for piping accessories.
4. Requirements of this Section are in addition to any similar or more comprehensive requirements in other Sections of Division 15.
5. Requirements of this Section apply to all the Sections in Division 15 except as may be specifically modified in those other Sections.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Electric motors.
2. Starters and disconnects provided under Mechanical Work.
3. Lists of material manufacturers.
4. Belt drives.
5. Coupling guards.
6. Pipe and fittings.
7. Valves.
8. Instrumentation.

B. Shop Drawings: Submit for pre-wired control panels, belt guards, and equipment supports.

1.03 SPECIFIC ELECTRICAL REQUIREMENTS: Except where modified by the specific requirements of an individual Mechanical Section in Division 15, the electrical work required for Division 15 Work is included under Division 16 - Electrical.

A. Contractor's Responsibility:

1. Changes: If the equipment provided under this Section requires changes under Division 16 - Electrical, the cost of such changes shall be borne under this Section at no increase in cost to the Owner.

2. Wiring Diagrams: Provide all wiring diagrams and information needed to complete installation of electrical work. Wiring diagrams shall correctly indicate conditions of this specific job and must be free from confusing operational methods that do not apply. All wiring diagrams shall be submitted for review.

3. Pre-Wired Control Panels: Where pre-wired control panels or equipment is provided under Division 15, internal wiring shall extend neatly to a terminal strip which shall have the same designations for terminals that are shown on the wiring diagram. Pre-wired panels shall be UL labeled.

4. Factory or Field Wiring: Where Work of Division 15 includes either factory or field wiring, materials and workmanship shall conform to requirements of Division 16 - Electrical, of this Section, and to all governing codes.

C. Power Supply: This Section is responsible for verifying the power requirements and compatibility with electrical before operating equipment.

PART 2 - PRODUCTS

2.01 PIPING SCHEDULE "A":

A. Typical Service: Condenser water.

B. Pipe - 10" and Smaller: Black ERW or butt weld steel, ASTM A53, Grade B.

C. Fittings:

1. 2" and Smaller: Black malleable iron screwed, ASTM A338.
2. 2-1/2" to 10": Carbon steel seamless or standard radius butt welded fittings, ANSI B16.9.

D. Unions: Black malleable iron with brass to iron seating on piping 2" and smaller.

E. Flanges:

1. Services Using Black Steel Pipe: ANSI weld-neck or slip-on where indicated.
2. Services Using Galvanized Steel Pipe: ANSI galvanized cast iron screwed.
3. Services Using Copper Tubing: MSS brass Mueller F900.

F. Grooved Pipe Couplings: Housing in two or more parts of either malleable or ductile iron castings. Couple-gasket molded synthetic rubber, ASTM D735, Grade No. 4615BZ. Coupling bolts oval neck track head type and hexagonal heavy nuts, ASTM A183. Victaulic.

G. Shut-Off Valves:

1. 2" and Smaller Ball Valves: 600 lb. wog, bronze body, screwed, stainless steel ball and steel handle, teflon seats, packing, and gasket; use Milwaukee Fig. No. BA-100SZ (600 lb.) as appropriate for pressure at point of application.

2. 2" and Larger: Butterfly valves (bubble tight shutoff):

a. 0 to 200 psi: Iron body of lug type with Type 316 stainless steel upper and lower stems and disc, EPT (EPDM) liner and stem "O" rings, Jenkins Fig. 231EL or Milwaukee Fig. ML223E.
b. Valves shall be designed for installation between Class 150 or Class 300 (as appropriate for pressure at the point of application) raised face steel flanges, and socket weld slip-on and lap joint flanges meeting ANSI Standards. Lug holes shall be threaded.
c. Valves 6" and smaller shall be provided with lever operator with position indicator.
d. Valves larger than 6" shall be provided with gear operator and those 6'-6" above the floor shall have chain wheels and guides.
e. Valves on insulated piping shall have a neck extension 2" above outside diameter of flanges to accommodate full thickness of insulation.

3. 2" and Smaller Gate Valves: Solid wedge, inside screw, non-rising stem, screw-in bonnet. Equivalent to Milwaukee Fig. No. 1176 (up to 400 psi) or No. 1186 (40 psi to 60 psi) as appropriate for pressure at point of application.

4. 2-1/2" and Larger: Gate Valves:

a. Up to 175 lbs.; OS&Y bolted bonnet, iron body with bronze trim; Crane 465 or Milwaukee Fig. No. F2885 (Class 125).
b. Valves shall be designed for installation between raised face steel flanges, and socket weld slip-on and lap joint flanges meeting ANSI Standards. Lug holes shall be threaded.
c. Valves 6" and smaller shall be provided with lever operator with positions indicator.
d. Valves larger than 6" shall be provided with gear operator and those 6'-6" above floor shall have chain wheels with guides.
e. Valves on insulated piping shall have a neck extension 2" above outside diameter for flanges to accommodate full thickness of insulation.

5. Operating Stem Extensions: Provide to clear insulation thickness.

H. Check Valves:

1. Swing Checks:

a. 2" and Smaller: Bronze body, screwed with regrinding bronze disc and screw-in cap, Jenkins Fig. 92A or Milwaukee No. 510 (250 lbs.) as appropriate for the pressure at the point of application.
b. 2-1/2" and Larger: Iron body, bronze trim with regrinding bronze disc and seat ring and bolted cover, Jenkins Fig. 624 or Milwaukee No. F2974 (200 lb.) or Jenkins Fig. 339-R or Milwaukee No. F2974 for pressure at point of application.

2. Spring Loaded Checks at Pump Discharge (Non-slam):

a. 2" and Smaller - 250 lb.: Cast iron body with bronze trim, screwed end type. Equivalent to Muessco Model 203AP.
b. 2-1/2" and Larger:
(1) 150 lb: Bronze body with bronze trim, globe type, Muessco Model 150M BP.
(2) 300 lb: Bronze body with bronze trim, globe type, Muessco Model 109 BP.

I. Y Strainers (All sizes): Cast steel flanges Y strainer with bolted strainer cap equivalent to Muessco No. 761 (150 lb.) or No. 762 (300 lb.) as appropriate for the pressure at point of application. Strainer screen shall be stainless steel with 0.0625" perforations up to 4" size and 0.125" perforations for sizes 5" and larger.

2.02 PIPING SCHEDULE "B":

A. Typical Service: Heating hot water and domestic water inside building.

B. Pipe: Up to 175 psi, 6" and smaller: Type L seamless copper tubing, cold drawn, hard temper, ASTM B88.

C. Fittings - Copper Piping: Wrought copper solder sweat type, ANSI B16.22 or brass castings, ANSI B16.18. Joints shall be soldered with 95/5 solder in accordance with ANSI B9.1. Leaded solder shall not be used.

D. Shut-Off Valves:

1. 2" and Smaller Ball Valves: 400 lb. wog, bronze body, screwed, stainless steel ball and steel handle, teflon seats, packing and gasket; equivalent to Nibco Fig. T-580-66 or Milwaukee No. BA-100SZ.

E. Check Valves:

1. Swing Checks - 2" and Smaller: Bronze body screwed with regrinding bronze disc and screw-in cap, equivalent to Jenkins Fig. 92A, as appropriate for pressure at point of application.

2. Furnish blow-off valve on all strainers piped to the nearest floor sink.

2.03 PIPING SCHEDULE "C":

A. Typical Service: Soil, waste, and vent.

1. Interior below ground (to 5' outside the building):
a. Piping: Standard weight cast iron no hub type soil pipe.
b. Fittings and traps: No hub cast iron soil pipe with cast iron clamps neoprene gasket and stainless steel nuts and bolts equivalent to MG couplings.

2. Above ground:
a. Piping: Standard weight cast iron no-hub type soil pipe.
b. Fittings: Standard weight cast iron no-hub type soil fittings and neoprene gasket and stainless steel bands and shields, no-hub couplings or cast iron clamps with neoprene gaskets and stainless steel nuts and bolts.

2.04 PIPING SCHEDULE "D":

A. Typical Service: Fire protection inside building.

B. Pipe - Up to 175 psi Working Pressure: 2" and smaller, Schedule 40 black steel pipe ASTM A120 or A53 Grade B.

C. Fittings - Up to 175 psi: 2" and smaller, Class 150 malleable iron fittings or grooved end mechanical joint fittings equivalent to Victaulic style 75.

2.05 PIPING SCHEDULE "E":

A. Typical Service: Condensate drains from cooling coil drain pans, exposed in equipment room.

B. Pipe: Copper, hard drawn Type M ASTM B88.

C. Fittings: Wrought copper solder fittings.

D. Cleanouts: Standard IPS plugged ends of laterals or tees.

2.06 PIPING SCHEDULE "F":

A. Typical Service: Underground condenser water

B. Pipe: Schedule 40 PVC, ASTM D1785

2.07 PIPING SCHEDULE "L":

A. Typical Service: Refrigerant piping.

B. Pipe: Seamless copper tubing, Type L, cold drawn, hard temper, ASTM B88.

C. Fittings: Wrought copper solder sweat type, ANSI B16.22.

D. Valves: Stop valves - Henry.

E. Filter Drier: Sporlan Type C replaceable core.

F. Sight Glass: Sporlan Type SA.

2.08 DIELECTRIC ISOLATORS:

A. Unions: For piping 2" and smaller, unions shall be brass solder sweat to IPS union with ground-joint and micarta sleeving.

B. Flanges: For piping 2-1/2" and larger, flanges shall be flanged sets with neoprene gasket for flat face flanges with bolt holes punched to receive bolt sleeves of 1/32" micarta with 1/8" thick micarta washers.

C. Manufacturer: Dielectric isolator shall be as manufactured by Maloney or EPCO.

2.09 HANGERS AND SUPPORTS: Hangers and supports shall be factory fabricated units with published load limits. Hangers and supports shall be Superstrut, or equal by Grinnell, Elcen, Fee & Mason, or Tolco. Hangers and supports for fire protection installation shall be in accordance with NFPA Standard No. 13.

A. Horizontal Piping: Hangers shall be of the following types:

1. Horizontal Waste and Vent 10" and smaller: Pipe hanger equivalent to Superstrut Model C-711.
2. Horizontal domestic cold water: Felt lined pipe hanger, Superstrut Model C-711-F.
3. Vertical Cast Iron or Steel Piping, All sizes: Riser clamp, Superstrut Model C-720.
4. Vertical Copper Water Piping, all sizes: Plastic coated riser clamp, Superstrut Model C-720-P.
5. Connectors:
   a. Beam clamps: Superstrut Model M-775-L with lock nut.
   b. Concrete spot inserts cast-in-place: Superstrut Model 452.
   c. Continuous concrete insert cast-in-place: Superstrut Model C-302 with end caps and closure strip.
   d. Concrete insert for steel deck: Superstrut Model C-475.
6. Rods:
   a. Carbon steel, cold drawn continuous thread, Superstrut Model H-104.

7. Trapeze Hangers: May be used for parallel piping arrangements. Submit detailed Shop Drawings for review.

8. Rod Size: Shall be a minimum of:

a. 2" and smaller pipe: 3/8" rod.
b. 2-1/2" to 3" pipe: 1/2" rod.
c. 4" to 5" pipe: 5/8" rod.

9. Roller Supports: Provide where provision for expansion is required.

10. Sway Bracing of Non-Resiliency Supported Pipe: Restraints shall be malleable iron bracket and pipe end assembly, Grinnell Fig. No. 112.

11. Trapeze or Framing: For four or less 2" pipes, shall be Unistrut, F&S Control, Elcen, Kindrol or Superstrut selected to support five times the weight or thrust. Submit details of other trapeze or framing for review.

12. Protection Shields and Insert Sections: Shields shall be 16 gauge galvanized steel for all piping and shall be performed to proper radius. Insert sections shall be as specified in Section 15180 - Mechanical Insulation.

B. Vibration Isolation: As specified in Section 15160 - Vibration Isolation and Seismic Restraints. Install metal back felt isolators under hangers of all uninsulated water piping, Trisolator S-100, or equal, by Trisolator or felt lined hangers by Tolco.

2.10 SLEEVES, CORE DRILLING, AND ESCUTCHEONS: Sleeves shall be permanently installed type where waterproofing is required cast-in-place or dry-packed in core drilled hole. Escutcheons shall be prime coated steel type except for escutcheons specified in Section 15450.

A. Sleeves: Shall be as follows:

1. Exterior walls and floor slabs below grade: Standard weight black steel pipe dry-packed in place with annular space caulked watertight.
2. Roof slab: Cast iron sleeve with integral flashing clamp, Smith No. 1722, or same type, by Josam, Zurn or Wade.
3. Floor slab with waterproof membrane. Standard weight black steel flashing collar.

B. Escutcheons: Shall be as follows:

1. 6" or smaller: Prime coated steel with set screw, Beacor 13, or equal by F&S Manufacturing Co.
2. Larger than 6": Prime coated brass with set screw, Beacor 3, or equal, by F&S Manufacturing Co.
3. Raised sleeves in floor slabs: Deep drawn prime coated steel or brass, F&S Mfg Fig. 605.

C. Caulking: Where appropriate shall be as follows:

1. Watertight: Products Research Co. "Rubber Caulk" No. 150 heavy type, or equal, by DAP, Dow Corning or General Electric.

2. Fireproofing: Caulked asbestos equivalent rope.

3. Sound Attenuating: Caulk with compressible polyurethane foam strip saturated with polybutylene, Ply-Tite or Compriband.

2.11 ACCESS PANELS: Sizes as required for complete access, minimum size 12" x 12". Deliver for setting under Division 9; direct location and setting after review.

A. Doors:

1. No. 13 USSG steel door and trim.
2. No. 16 USSG steel frame.
3. Metal wings for keying into construction.
4. Concealed hinges, screwdriver operated stainless steel cam lock.
5. In plaster ceilings similar to Karp DSC.211 FRT, or equal, by Milcor Steel Co. or Higgins Mfg. Co.
6. In wallboard similar to Karp DSC-214M, or equal, by Milcor Co. or Higgins Mfg. Co.

7. Access panels in tiled wall shall be stainless steel with an AISI No. 4 finish on exposed surfaces.
8. Access panels at lobbies and corridors shall be KARP RDW with Gypboard panel.

B. Identification: Access tile of concealed work provided under Section 09510 Acoustical Ceilings. Submit for review.

2.12 VALVE OPERATORS:

A. Chain Operators: Valves 8" and larger installed 8' and higher in equipment rooms shall be provided with chain operators with chains swagged to 5'6" above the floor and hooked up out of the way.

B. Wrenches: Plug valves (Cocks); furnish 12" wrench for valves 2" and smaller, 18" wrench for 4" valves, and 36" wrench for valves 6" and larger.

C. Solenoid Valves: 125 lb. bronze bodied, screwed, stainless steel trim, normally closed 2-way, and 120 volts, 60 Hertz, General Controls K-15, or equal by Asco.

2.13 PIPE WRAPPING:

A. Cast and Ductile Iron Pipe and Fittings Buried in the Earth: Protect using polyethylene wrap and a sand bed and backfill as specified below, and where required by these Specifications.

1. Polyethylene wrap shall be 8 mil polyethylene sheet, meeting and installed in accordance with ANSI A21.5 and AWWA C-105.
2. Bed and backfill shall be clean sand, free of deleterious amounts of chemicals. Backfill shall completely surround the encased item to a minimum thickness of 4".
3. Polyethylene wrap shall be used on all pressurized ductile and cast iron pipe and fittings, including such fittings on non-metallic piping.
4. Sand bed and backfill and polyethylene wrap shall be used on any cast or ductile iron pipe and fittings that are not under pressure.
5. Sand bed and backfill shall be used on steel and cast iron valve bodies, fittings, etc.

2.14 ELECTRIC MOTORS: Open drip-proof, continuous duty, 40° C rise type with Class "B" insulation unless otherwise specified. Provide "weather protected" motors, NEMA Type I, with special Class "B" moisture resistant insulation. All three phase motors shall have regreasable ball bearings. Furnish General Electric, US Electric, Century, Sterling, or Westinghouse motors.

A. Motors not directly exposed to the weather and located in non-hazardous spaces shall have drip-proof enclosures and shall have continuous duty rating of 40°C.
B. Motors installed in unguarded outdoor locations shall be totally enclosed, fan cooled and continuous duty rating at 55° C.
C. Where motor is an integral part of the equipment, the motor manufacturer shall be as recommended by equipment manufacturer.
D. Motors shall in all cases have adequate starting torque to bring driven equipment up to rated speed in a time interval acceptable to the Architect.
E. Motors 1/2 HP and larger shall be 460 volt, 3 phase, 60 Hertz, ball bearing, of NEMA design B, NEC Code F or lower in-rush.
F. Motors smaller than 1/2 HP shall be 120 volt, single phase, 60 Hertz of NEMA design B, NEC Code F or lower with internal thermal protection.
G. Control panels: Where specified panels shall be a NEMA 12 enclosure pre-wired for one point feeder supply connection, and shall include the following:
   1. Across-the-line magnetic type starter with overload protection and HOA switches.
   2. Fused switches with dual element fuses.
   3. Control transformer with fused primary and fused secondary protection.

2.15 COUPLINGS: Couplings for direct drive equipment shall be flexible, self-aligning, non-lubricating type, rated at least 125% of motor rated horsepower, coupling halves shall be keyed and locked on shafts. Couplings shall be Fast's Standard.

2.16 BELT DRIVES: V-Belt type with the appropriate sheaves. Drives requiring one or two belts shall be provided with variable pitch sheaves. Drives requiring three or more belts shall have non-adjustable drive sheave. Sheaves and belts shall be Browning, Dodge, or Gates.

A. Sheaves: Sheaves shall be cast iron, machined and balanced. Variable pitch sheaves shall be selected for mid-point of equipment operating capacity. Sheaves shall be keyed and located on shafts, with allen head set screws. On fractional horsepower motors on NEMA frame size 48 and smaller sheaves may be secured to shaft with set screws only.

B. Ratings - All Other Belt Drives: Minimum horsepower rating, at design speed, of 1.5 times the motor nameplate horsepower rating.

2.17 GUARDS: Rotating elements on equipment shall have protective devices in accordance with Title 8 CCR, Division of Industrial Safety and General Safety Orders and OSHA requirements.

A. Coupling Guards: Shall completely enclose the rotating coupling and shall be constructed of heavy gauge steel in accordance with OSHA requirements.

B. Belt Guards: Guards shall totally enclose the belts and sheaves. Guards shall be fabricated of galvanized expanded metal sides, solid galvanized steel band and adequately sized galvanized angle iron frame. Adequate room for belt adjustments shall be provided. Tachometer holes with covers shall be provided for both sheaves.

2.18 APPROVED MANUFACTURERS: Manufacturer's products named in this Section were selected for desired type, quality, and performance. Other manufacturers producing products of acceptable type, quality, and performance are listed herein. Approved manufacturers are as follows:

A. Grooved End Fittings:

Victaulic
Gustin Bacon
Gruvlok

B. Shut-off Valves (Gate and Ball Valves):

Nibco Scott	Crane
Lunkenheimer	Walworth
Jenkins	Milwaukee

C.. Butterfly Valves:

Jenkins	Mission
Crane	Centerline
Posi-Seal	Deming
Lunkin	Keystone
Pratt	

D. Check Valves - Non-Slam:

Mueller	Smolensky
Williams-Hager	

E. Check Valves:

Crane	Lunkenheimer
Jenkins	Nibco
Walworth	
Milwaukee	

F. Throttling Valves (Globe):

Nibco-Scott	Crane
Lunkenheimer	Walworth
Jenkins	

G. Plug Cocks:

Crane	Walworth	Rockwell-Nordstrum
Lunkenheimer	DeZurik	

H. Non-Hub Piping Couplings:

"MG" Coupling	Clamp-All
Tyler Pipe	

I. Instruments/Gages:

Marsh	Palmer
Weiss	US Gauge
Trerice	

PART 3 - EXECUTION

3.01 GENERAL:

A. Rough-in Work: Proceed as rapidly as the building construction permits, completed, tested, and approved before being closed.

B. Conceal all piping with finished rooms, unless otherwise shown.

C. Cleaning: Thoroughly clean piping before installation. Cap all pipe openings to exclude dirt until fixtures are installed and final connections made.

D. Fitting: Cut pipe accurately to measurements established at the building; work into place without springing or forcing; properly clear all windows, doors and other openings. Cutting or other weakening of the building structure to facilitate piping installation shall not be permitted.

E. Pipe Damage: Show no tool marks or threads on exposed plated, polished or enameled connections from fixtures. Tape finished surfaces to prevent damage during plastering.

F. Changes: Make changes in direction with fittings and changes in main sizes through eccentric reducing fittings. Unless otherwise noted, install water supply and return piping with straight side of eccentric fittings at top of pipe.

G. Slope: Pitch pipe lines as required for proper drainage and elimination of air as follows:

1. Waste: 1/4"/ft. downward towards mains.
2. Vents: 1/8"/ft. upward away from fixture trap.

H. Joints: Provide sufficient swing joints, ball joints, expansion loops, and devices necessary for a flexible piping system, whether or not shown on the Drawings.

I. Fastening:

1. Securely bolt in place to building structures, all equipment, isolators, hangers, etc.
2. Provide clamps, braces and/or concrete thrust blocks on all deadends, angles or at other points where separation may occur from hub and spigot pipe or no-hub piping.

J. Union and Shut-off Valves: Provide suitably located to facilitate maintenance and removal of all equipment apparatus.

K. Equipment by Others: For rough-ins and final connections to equipment furnished by others, ascertain exact sizes, services and locations, before starting work. Verify accuracy of work shown on Drawings before starting work. Contractor is responsible for providing proper installation.

L. Dissimilar Metals: Provide complete dielectric isolation between ferrous and non-ferrous metals.

3.02 HANGER AND SUPPORTS

A. Installation: Securely fasten all piping to building construction with approved iron hangers, supports, guides, anchors and sway braces to maintain pipe alignment and prevent sagging, noise and excessive strain due to uncontrolled movement under operating conditions. Supports shall be designed for a safety factor of 5 to 1 for gross weight of piping system including fluid and insulation.

1. Relocate any hangers as necessary to correct unsatisfactory conditions that may become evident when system is put into operation.
2. Where hanger rods are longer than 18" provide a lateral brace every fourth hanger. Supporting of piping by wire, rope, wood or other makeshift devices will not be permitted.
3. Burning of holes in beam flanges or narrow members will not be permitted.
4. Sway bracing of non-resilient supported piping shall be in accordance with SMACNA Guidelines for Seismic Restraint of Mechanical Systems, except that fire protection piping shall be supported per NFPA requirement. Piping more than 6'0" below structure shall be restrained by a Type IV System - refer to Section 15160.
5. Fasten hanger rods to structural steel members with suitable beam clamps.
6. Protect pipe insulation at every hanger, support, or guide of insulated piping with inserts and shields.
7. Piping within 50' of risers or equipment that is vibrationally isolated or where specified or shown shall be spring supported and restrained by a Type IV Restraint System, refer to Section 15160.

B. Manifolding: Parallel runs of piping, except for fire protection piping, may be supported on trapeze hangers, spaced as required for the smallest pipe carried. Piping in chases shall be supported on channel framing. Channel framing shall be selected to support five times the weight or thrust of the piping without failure in accordance with the manufacturer's standard ratings and submit details for review.

C. Hanger Spacing:

1. Maximum spacing for horizontal piping supports shall be as follows:

Pipe Size Diameter	Rod Brass, Steel Wrought Iron Hanger Spacing	Copper Tubing and Stainless Hanger Spacing	Cast Iron Soil and Storm Spacing
Up to 1-1/4"	3/8 6' - 0"	6' - 0"	
1-1/2" to 2	3/8 8' - 0"	6' - 0"	
2-1/2" to 3	1/2 10' - 0"	8' - 0"	All Sizes
4" and 5"	5/8 12' - 0"	8' - 0"	5-0 and each
6"	3/4 12' - 0"	joint	
8"	7/8 14' - 0"		

2. Where building structure does not permit the specified spacing, the Contractor shall provide additional adequate support. Location and details shall be submitted for review.

3.03 ANCHORS AND SUPPORTS:

A. In Concrete Floor: Steel plates and rebar as detailed on the Drawings. Anchor bolts shall be in accordance with UBC Table 26G.

B. Hangers: From beams shall be with beam clamps.

3.04 PIPE JOINTS:

A. Copper Tubing:

1. Cut square, remove burrs and clean inside of female fitting to a bright finish with steel wool, wire brush, sandpaper or emery cloth. Apply solder flux with brush to tubing. Remove internal parts of solder-end valves prior to soldering.
2. Provide dielectric unions at points in connection of copper tubing and any ferrous and equipment.
3. Joining for copper pipes shall be as follows:
   a. Water piping: Phosphorus copper solder.
   b. Condensate: Sil-Fos brazing.
   c. All underground: Sil-Fos brazing.

B. Screwed Piping: Cut with machine cutter, hand pipe cutter or carborundum pipe wheel. Deburr with file or scrapper or pipe reamer. Do not ream to exceed ID of pipe and thread to ANSI B2.1 requirements. Use teflon tape or teflon paste on male thread prior to joining other services. No more than two full threads shall remain exposed after joining. Use litharge and glycerin on joint prior to joining for air piping.

C. Brass Screwed Pipe: Cut threads, remove burrs, and apply red lead or approved pipe dope as specified for steel screwed pipe. Makeup pipe with surface of chrome plated pipe and fittings. Do not mark surface of chrome plated pipe and fittings.

D. Cast Iron Piping:

1. Hub and spigot: Rubber compression type gaskets.
2. Plain end piping: Neoprene sleeve ASTM C564 and stainless steel clamp.

E. Leaky Joints: Remake leaky joints with new material. Remove leaking section and/or fittings as directed. Do not use thread cement or caulking to make joint tight.

3.05 ACCESS TO EQUIPMENT:

A. General: All piping, equipment and accessories shall be installed to permit convenient and code required access to maintenance. All relocation of piping, equipment and accessories required to provide maintenance access shall be accomplished at no additional cost.

B. Access: Supply access doors where any valves, fire dampers, motors and equipment requiring access for servicing, repairs or maintenance are located in walls, chases, above ceilings or in ductwork. Coordinate location of access panels with applicable trades installing walls or ceiling. Make arrangement for the necessary openings in the building to allow for admittance of all apparatus. Access doors or panels shall be installed as specified by Section 08305 Access Panels.

3.06 SLEEVES, CORE DRILLING AND ESCUTCHEONS:

A. Sleeves: Provide sleeving for all piping that penetrates exterior walls, equipment room floors, roof, kitchen floors, and like areas where waterproofing is required.

1. Steel sleeves: Secure waterproofing membrane under flashing clamp. Caulk annular space watertight.
2. Steel, asbestos cement, or concrete sleeves: Dry pack in place and caulk annular space.
3. Sleeves in equipment room floors shall extend 2" above finish floor with annular space caulked watertight.

B. Core Drilling: Core drilled holes shall be adequately sized to allow for dry packing sleeves in place; to allow for insulation to extend through holes; to allow for fireproof caulking or clearance around pipe to prevent direct contact between pipes and structures. Locations of all core drilling shall be reviewed prior to drilling.

C. Escutcheons: Provide escutcheons on all piping that penetrates floors, walls and ceilings where exposed to view.

3.07 VALVES:

A. General: All valves shall be first quality of approved manufacture, and shall have proper clearances, and shall be bubble tight at the specified test pressure.

1. Each valve shall have the maker's name or brand, the figure or list number, and the guaranteed working pressure cast on the body and cast or stamped on the bonnet, or shall be provided with other means of easy identification.
2. Valves shall be minimum working pressure and materials as fittings specified for the service except as herein modified.
3. Gate and globe valves shall be suitable for repacking under pressure. Regardless of service, valves shall not be designed for less than 125 psi. per square inch steam working pressure and must meet the pressure requirements at the point of installation.

B. Arrangement: Valves shall be installed in the systems so located, arranged and operated as to give complete regulation of all apparatus, equipment and fixtures.

C. Installation: Valves shall be installed in the following locations:

1. In all branches and/or headers of water piping serving a group of fixtures.
2. On both sides of all apparatus and equipment.
3. On both sides of all check valves.
4. For shutoff of risers and branch mains.

5. For flushing and sterilizing the systems.
6. Where shown on the Drawings.
7. Valves shall be installed for accessibility and easy maintenance.

3.08 STRAINERS: Install bronze bodied strainers in copper piping systems. All blow-out connection shall be valved with the valve sized same as the blow-out connection. Valves shall be gate or ball type.

3.09 FLASHING ON PIPING: Provide flashing assembly with counter-flashing on each pipe passing through roof. Provide necessary counter-flashing.

3.10 EQUIPMENT: Provide all necessary steel framing supports for piping and equipment for a complete and satisfactory installation. Coat all concealed or inaccessible as specified under Painting. Submit Shop Drawings of miscellaneous support for review.

END OF SECTION

SECTION 15160

VIBRATION ISOLATION AND SEISMIC RESTRAINTS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 and Sections 15010 and 15050 apply to this Section. Provide the vibration isolation and seismic restraints, complete.

A. Work In This Section: Principle items include:

1. Vibration isolation elements for piping and equipment.
2. Equipment isolation bases.
3. Seismic restraints for piping and equipment.

B. Related Work Not In This Section:

1. Domestic Water System, Section 15402.
2. Drainage System, Section 15414.
3. Fire Protection System, Section 15500.
4. Air Moving Equipment, Section 15800.
5. Ductwork, Section 15840.
6. Duct and Plenum Lining, Section 15848.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Catalog cuts and data sheets on specific vibration isolators and restraints to be utilized showing compliance with requirements specified.
2. An itemized list showing items of equipment or piping to be isolated, the isolator type of model number selected, isolator loading and deflection, and reference to the specific Drawings showing frame and construction where applicable.
3. Written approval of the frame design to be used, obtained from the equipment manufacturer.
4. Seismic restraint calculations with licensed structural engineer's signature.

B. Shop Drawings: Submit showing the following:

1. Equipment frame construction for each machine, including dimensions, structural member sizes and support point locations.
2. Methods of suspension, support guides for piping and ductwork.
3. Methods for isolation of pipes and ductwork piercing walls and slabs.
4. Concrete and steel details for bases including anchor bolt locations.
5. Number and location of seismic restraints and anchors for each piece of equipment.
6. Specific details of restraints including the anchor bolts for mounting and maximum loading at each location.

1.03 QUALITY ASSURANCE:

A. Code and Standard Requirements: Seismic restraints shall be in accordance with SMACNA Guidelines for Seismic Restraints of Mechanical System, latest edition, and for Factory Mutual Insurance requirements.

B. Manufacturer Responsibilities: Manufacturer of the vibration isolation and seismic control equipment shall have the following responsibilities:

1. Determine vibration isolation and seismic restraint sizes and locations.
2. Provide piping and equipment isolation systems and seismic restraints as scheduled or specified.
3. Guarantee specified isolation system deflection.
4. Provide installation instructions, drawings, and field supervision to assure proper installation and performance.
5. Furnish calculations to determine restraint loads resulting from seismic forces presented in UBC 2312, governing codes, project seismic requirements; with a minimum 0.5G seismic acceleration applied at the equipment center of mass. Snubbers shall be capable of withstanding a minimum of

2.0G load without obvious deformation. The seismic calculations shall be certified by a licensed structural engineer, experienced in the design of restraints for flexibly mounted equipment.

6. Furnish certification of seismic restraints capability to safely accept the loads resulting from seismic forces determined by methods defined above. Certification must be substantiated by calculations or test reports verified by a licensed structural engineer.
7. Provide approved resilient restraining devices to limit equipment and piping motion over 3/8".

C. Intent: It is the objective of this Section to furnish necessary design for the avoidance of excessive noise and vibration in the Buildings due to the operation of machinery or equipment, and/or due to interconnected piping, ductwork, or conduit. The installation of all vibration isolation units, and associated hangers and bases, shall be under the direct supervision of the vibration isolation manufacturer's representative.

1. All vibration isolators shall have either known undeflected heights or calibration markings so that, after adjustment, when carrying their load, deflection under load can be verified, thus determining that the load is within proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
2. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer, and must be linear over deflection range of not less than 50% above the design deflection.
3. The ratio of lateral to vertical stiffness shall be not less than 0.9 nor greater than 1.5.
4. Theoretical vertical natural frequency for each support point, based upon the load per isolator and isolator stiffness shall not differ from the design objectives for the equipment as a whole by more than +/- 10%.
5. Neoprene mountings shall have a Shore hardness of 40 to 65 durometer, after minimum aging of 20 days or corresponding oven-aging.
6. Substitution of "Internally Isolated" mechanical equipment in lieu of the specified isolation of this Section must be approved for individual equipment units.
7. Provide a maximum of four vibration isolators located at corners of the equipment unless approval is obtained for additional isolators. Where feasible provide three isolators.

PART 2 - PRODUCTS

2.01 ISOLATOR DESCRIPTION:

A. Specification D: Vibration hangers shall contain a double deflection neoprene element with a rod isolation bushing that passes through the hanger box. Hangers shall be Type HD as manufactured by Mason Industries, Inc.

B. Specification E: Vibration hangers shall contain a steel spring with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include a scale drawing of the hanger showing the 30° capability. Hangers shall be Type 30 as manufactured by Mason Industries, Inc.

2.02 FLEXIBLE CONNECTORS:

A. Flexible Stainless Hose: All flexible stainless steel hose shall have a stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged, smaller sizes shall have male nipples. Bronze braided flexible hose with female sweat ends shall be used for all copper lines. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts whenever possible. Flexible metal hose shall be Type BSS or BBF as manufactured by Mason Industries, Inc.

2.03 SEISMIC RESTRAINTS:

A. Specification SC: Restraints of all suspended piping, ductwork, equipment and curb mounted units shall consist of steel cables arranged to achieve the required all-directional restraint, and sized to resist seismic loads. Submittal Shop Drawing shall indicate proposed method of achieving vertical restraint where required. Cables shall be installed with sufficient slack to avoid short circuiting the vibration isolators. Mason Industries, Type SSC, Seismic Slack Cables.

PART 3 - EXECUTION

3.01 GENERAL: Install in accordance with manufacturer's written instructions. Vibration isolators must not cause any change of position of equipment or piping resulting in piping stresses or misalignment.

A. All mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators as scheduled on the Drawings.
B. Piping and ductwork to be isolated shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow the passage of piping or ductwork, and maintain 3/4" to 1-1/4" clearance around outside surfaces. This clearance space shall be tightly packed with fiberglass, and caulked airtight after installation of piping or ductwork.
C. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified.
D. Electrical circuit connections to isolated equipment shall be from above and shall not penetrate the flow slab and shall be looped to allow free motion of isolated equipment.
E. Contractor shall not install any equipment, piping, or conduit making rigid contact with the "building" unless permitted in this Section. Building includes, but is not limited to, slabs, beams, columns, studs, and walls.
F. Coordinate Work of this Section with other trades to avoid rigid contact with the building. Inform other trades providing following Work, such as plastering or electrical, to avoid any contact which reduces the vibration isolation.
G. Notify the Architect, prior to installation, of any conflicts with other trades which result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen condition. Corrective work required by conflicts after installation shall be at the responsible contractor's expense.
H. Notify the Architect of discrepancies between requirements specified and field conditions or changes required due to the specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the Contractor's expense.
I. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.
J. Correct, at no additional cost, all installations which are deemed defective in workmanship or materials.
K. Purchased and/or fabricated equipment shall be designed to safely accept external forces of 0.5 G load in any direction for all rigidly and resiliently supported equipment, piping and ductwork without failure and permanent displacement of the equipment.
L. Life safety equipment such as must be capable of safely accepting external forces up to 1.0 G load in any direction without permanent displacement of the supported equipment.

3.02 EQUIPMENT ISOLATORS: Mount floor mounted equipment on 4" concrete housekeeping pads over complete floor area of equipment. Mount vibration isolating devices and related inertia blocks on concrete pad. Provide approved seismic restraint anchor plates flush with top of housekeeping pad. Concrete work is specified in Division 3.

A. Each fan and motor assembly shall be supported on a single base. Flexible duct connections shall be provided at inlet and discharge ducts.

3.03 PIPING ISOLATORS: All piping, except fire standpipe systems, is included under this Section.

A. Domestic Water System and Refrigerant Piping Isolation: Support all the domestic water piping in horizontal and vertical runs with a resilient wrapping or clamp system employing a resilient element of wool, felt, neoprene, or other suitable material, "Trisolators" by Semco or P.R. Isolators by Potter-Roemer.

END OF SECTION

SECTION 15180

MECHANICAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide mechanical insulation, complete.

A. Related Work Not In This Section:

1. Basic Mechanical Materials and Methods: Section 15050.
2. Domestic Water System: Section 15402.
3. Air Moving Equipment: Section 15800.
4. Ductwork: Section 15840.
5. Duct and Plenum Lining: Section 15848.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Piping insulation.
2. Ductwork insulation.
3. Equipment insulation.
4. Insert sections.

B. Shop Drawings: Submit for removable type insulation.

PART 2 - PRODUCTS

2.01 GENERAL: Installed products shall be in accordance with the requirements of the California Mechanical Code 2001, NFPA Standards No. 90A and No. 90B, and California Code of Regulations, Title 24, Energy Conservation.

2.02 TYPE P-1 INSULATION - PIPE:

A. Type: One-piece performed glass fiber insulation with all purpose fire retardant jacket and "K" factor of 0.24 at 75°F mean temperature.

B. Manufacturer: Insulation shall be Manville Corp. "Flame-Safe", or equal, by Owens-Corning Fiberglas or CertainTeed. Adhesive shall be Benjamin Foster 85-20, or equal.

2.03 TYPE P-2 INSULATION - PIPE (VAPOR SEAL):

A. Type: One-piece performed fiber glass with all purpose fire retardant vapor barrier jacket and "K" factor of 0.24 at 75°F mean temperature.

B. Manufacturer: Insulation shall be Manville Corp. "Flame- Safe", or equal, by Owens-Corning Fiberglas or CertainTeed. Adhesive shall be Benjamin Foster 85-20.

2.04 TYPE P-4 HANGER INSERT SECTION - PIPE: Insert sections shall be asbestos free hydrous calcium silicate or rigid foamed plastic pipe insulation in half sections 2" longer than protection shield being used.

2.05 TYPE D-1 INSULATION - DUCTWORK CONCEALED:

A. Type: Foil faced inorganic glass fiber flexible blanket; insulation shall have a "K" factor of 0.24 at 75°F mean temperature.

B. Manufacturer: Manville Corp. "Micro-Lite" or same type and quality by Owens-Corning Fiberglas or CertainTeed.

2.06 TYPE D-2 INSULATION - DUCTWORK EXPOSED:

A. Type: 3 pcf density inorganic glass fiber non-flexible with pre-sized 8 ounce canvas vapor barrier jacketing. Insulation shall have a "K" factor of 0.24 at 75°F mean temperature.

B. Manufacturer: Manville Corp. Series 800 "Spin-Glass", or approved equal by Owens Corning Fiberglas 703 or CertainTeed. Adhesive shall be Benjamin Foster 85-20.

2.07 SERVICE AND TYPE: Shall be as follows:

Service	Thickness	Type
Domestic Hot Water Supply & Return	1"	P-1
Drip Pan Drains (above ceilings)	3/4"	P-2
Supply Air Ducts	1" or 2"	D-1
Hanger	Pipe Insulation Thickness	P-4
Refrigerant Suction	1-1/2"	P-2
Heating Hot Water Supply & Return	1-1/2"	P-1

PART 3 - EXECUTION

3.01 APPLICATION OF PIPING INSULATION:

A. Type P-1: Insulation shall be applied as follows:

1. All joints shall be tightly butted together.
2. Exposed piping insulation shall be secured by applying a brush coat of fire retardant adhesive to the longitudinal lap and butt strips.
3. Concealed piping insulation shall be secured with 9/16" coated flare type staples on 4" centers on the longitudinal lap and butt strips.
4. Fittings and valve bodies shall be insulated with PVC pre-molded fitting covers equal to adjoining insulation thickness and type.
5. Flange bolts shall not be insulated but left accessible for valve or fitting removal without disturbing the insulation.
6. Insulate strainer bodies with readily removable insulation sections for removal of strainer screens.

B. Type P-2: Insulation shall be applied as follows:

1. All joints shall be tightly butted together.
2. Exposed and concealed piping insulation shall be secured by applying a brush coat of fire retardant adhesive to the longitudinal lap and butt strips.
3. Butt ends shall be sealed off at all valves, fittings and flanges and at every 20' in straight runs.
4. Fittings and valve bodies shall be insulated with PVC premolded fitting covers equal to adjoining insulation; thickness and type.
5. Flange bolts shall not be insulated but left accessible for valve or fitting removal without disturbing the insulation, except for chilled water applications which the entire flange shall be insulated with removable sections.
6. Insulate strainer bodies with readily removable insulation sections for removal of strainer screens.

C. Type P-4: Insert Sections:

1. Install insert sections on insulated piping located centrally under each hanger. Vapor barrier and jacketing shall be continuous over insulation.
2. Extend vapor barrier and jacketing continuously over insert.
3. Fabricate inserts of the same thickness as the adjoining insulation.

D. Type D-1: Insulation shall be applied as follows:

1. Insulation shall be cut long enough to avoid reduction of insulation thickness at the duct corners.
2. Edges shall be lapped not less than 3", longitudinal joints lapped and stapled.
3. Secure insulation in place with 16 gauge galvanized wire at 12" centers.
4. All cuts and tears shall be neatly patched.

E. Type D-2: Insulation shall be applied as follows:

1. Insulation shall be cut to the exact size to snugly fit the duct without overlaps, buckles, and/or reduction of thickness at the corners.
2. Longitudinal seams and butt edges shall be tightly butted together.
3. Secure insulation to ducts with weld pins spaced 12" centers with minimum of two rows per side.
4. Clip protruding pin ends flush with clip.
5. Insulation shall be cut to fit snugly between standing duct joints and stiffener angles. Cover joints or angles with an additional layer of the insulation adhered with fire retardant adhesive and edges finished with 3" wide vapor barrier tape to match the jacketing.
6. Insulation shall be finished with an 8 ounce jacket and Benjamin-Foster 30-36 lagging adhesive.

END OF SECTION

SECTION 15300

FIRE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide all materials and labor needed for the installation of Fire Sprinkler Systems as shown on the Drawings and specified.

A. Related Sections: The Contractor and Fire Sprinkler Subcontractor shall comply with the following Project Manual Divisions and Sections:

1. Division 16 - Electrical.
2. Section 01330 - Submittals.
3. Alarms, Division 16 - Electrical.
4. Drains, Section 15050 - Basic Mechanical Materials and Methods.
5. Earthwork, Division 2- Site Work.
6. Warranty, Section 01790 - Warranties and Guarantees.

1.02 SYSTEM DESCRIPTION: The design and installation of the Sprinkler System shall be based upon an overall Office Occupancy, Light Hazard. See following requirements for specific densities for areas of the building that are other than office.

A. Fire Sprinkler System shall be supplied from the on-site Fire Protection Water System. The Contractor and Fire Sprinkler Subcontractor are responsible for verifying the accuracy of all water supply data and shall obtain concurrence with the Building, Fire, and Water Departments. The Sprinkler Systems shall be designed to not more than 90 percent of the available water supply.

B. Provide and properly adjust the Sprinkler System Supervisory Switches (tamper switches) and Waterflow Indicators (flow switches).

C. Provide all necessary drains for the Fire Sprinkler System and, if necessary, pipe to building drains. Provide drains as necessary for testing and draining of the Fire Sprinkler System.

D. In addition to the flow switch for the monitoring, the risers shall be installed with alarm valves, trim, and water motor gong.

E. Provide shields necessary to protect electrical equipment from sprinkler discharge.

F. The Contractor and Fire Sprinkler Subcontractor shall be responsible for carrying out the required tests on the Fire Sprinkler Piping and coordinate them with the City of Los Angeles, Los Angeles Fire Department, and any other Authority Having Jurisdiction. The Contractor, Architect, and Owner shall be notified of the testing dates and times.

G. The Contractor and Fire Sprinkler Subcontractor shall obtain all approvals required for the Work of this Section from all public authorities having jurisdiction, Owner, project insurer, and from the Architect.

H. Fire Sprinkler Subcontractor shall coordinate Work of this Section with other trades working on the site.

I. The underground piping shall include, but not be limited to, the information shown on the Architectural and Civil Drawings. The Fire Sprinkler Subcontractor shall submit plans (fees for city connection and new public hydrants shall be paid by Owner) for the installation of public fire hydrants and one (1) City Connection, per Local Municipal Water District and Los Angeles Fire Department.

J. Provide all control valves and other appurtenances as required for a fully operable system as approved by the Architect, Owner, City of Los Angeles, Los Angeles Fire Department, and all other Authorities Having Jurisdiction (AHJs).

K. Sprinkler System Design Criteria:

1. The Office Areas shall be designed for a Light Hazard Occupancy of 0.10 gpm for the most remote 1,500 square feet. A hose allowance of 100 gpm shall be added at the point of connection for hose or fire hydrants.

2. The unimproved areas of the building (future office areas) shall be protected in accordance with the requirements of Los Angeles Fire Department and, in addition, the spacing shall not exceed 130 square feet. The fire sprinklers shall be installed on a 1" arm-over (rooster tail) with the sprinkler in the upright position and a 1" plug facing down for future drops.

3. Mechanical Rooms shall have a density of 0.15 gpm over the most remote 1,500 square feet (Ordinary Hazard Group 1). A 250 gpm hose allowance shall be included in the hydraulic calculations.

4. Storage Rooms shall have a density of 0.20 gpm over the most remote 1,500 square feet (Ordinary Hazard Group 2). A 250 gpm hose allowance shall be included in the hydraulic calculations.

5. The office area shall be designed to deliver 0.10 GPM over the most remote 1500 square feet. A 100 gpm hose stream allowance shall be included in the hydraulic calculations.

6. The densities stated herein are the minimum acceptable. The Fire Sprinkler Subcontractor shall confirm densities and areas of application with local codes and authorities having jurisdiction (AHJs) and increase as necessary. Verify with the Authority Having Jurisdiction the requirements for the unused attic spaces and their densities.

7. The Fire Sprinkler Subcontractor shall follow the hydraulic design criteria in the NFPA Standards that apply to this office and storage application.

8. The calculations shall include an inside hose stream at the hose valve closest to the floor control assembly. The outside hose stream allowance shall be included in the hydraulic calculations at the point of connection to the part of the onsite water piping system that most closely connects to a fire hydrant.

1.03 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Required: The Fire Sprinkler Subcontractor will be authorized to start each portion of the Work of this Section when the Shop Drawings, catalog cuts and hydraulic calculations for that portion of the Work of this Section are received, reviewed, and approved by the project insurer, Architect, Owner, the City of Los Angeles, and Los Angeles Fire Department. Installation prior to these approvals shall be at the risk of the Contractor and Fire Sprinkler Subcontractor.

B. Submittals: The Fire Sprinkler Subcontractor shall submit to the Contractor Shop Drawings, Product Data, catalog cuts, and hydraulic calculations for submission to the Architect for review in accordance with Section 01330.

1. Shop Drawings shall show all of the information required by NFPA-13 and 20 for working plans and shall include drawings showing the location of all equipment, controls, piping, valves, and drains. The drawings shall also show the locations of all sway bracing and flexible couplings installed as flexure joints. Information required in NFPA 13, Section 6-1, 6-2 and 6-3 and NFPA 20 shall be shown on the Shop Drawings. Earthquake sway braces shall be provided and detailed.

2. Product Data: Shop drawings shall be accompanied by a list of all material to be used for the fire sprinkler system. The manufacturer, trade name, and catalog number shall be given for each item.

3. Other Submittals:

   a. Prior to start of installation, the Fire Sprinkler Subcontractor shall submit copies of all permits and approvals to the Architect, necessary to conduct the Work.
   b. Fire Sprinkler Subcontractor shall deliver to the Architect one copy of all documents that are reviewed and approved by the local code authorities. These documents shall include, but not limited to, the following:
      (1) Site inspection forms.
      (2) Permit drawings.
      (3) Final inspection forms.
      (4) All these documents shall include all required approval stamps, signatures or other information necessary to properly certify that the installation has been reviewed and approved by City of Los Angeles, Los Angeles Fire Department, and other enforcing AHJ's.

4. Documents for Owner: The Fire Sprinkler Subcontractor shall deliver the following items to the Architect for the Owner:

a. Copy of NFPA-25.
b. Copy of all test certificates and approvals.
c. A list of recommended spare parts.

C. Record Documents: The Contractor and Fire Sprinkler Subcontractor shall prepare and submit Project Record Drawings and Record Project Manual in accordance with Section 01770 - Closeout Procedures and Submittals.

D. If the Submittals under this Section, upon review by the Architect, do not conform to the requirements specified, the Contractor and Fire Sprinkler Subcontractor will be required to resubmit with all necessary modifications, within ten (10) working days of receipt of the Architect's notification of rejection. The Contractor and Fire Sprinkler Subcontractor shall be responsible for the Architect's extra expenses for subsequent review of rejected Submittals necessitated by the Fire Sprinkler Subcontractor's failure to make the requested modifications. Such extra fee amounts will be deducted from payments by the Owner to the Contractor.

1.04 QUALITY ASSURANCE:

A. Standards: All Work of this Section shall conform to the requirements of the applicable portions of the National Fire Protection Association (NFPA) Standards, their appendix and Recommended Practices listed herein, as modified by the City of Los Angeles, Los Angeles Fire Department and other governing AHJ's.

1. NFPA 13, 1999 edition, "Standard for the Installation of Sprinkler Systems".
2. NFPA 14, 1993 edition, "Standard for the Installation of Standpipe and Hose Systems".
3. NFPA 24, 1992 edition, "Standard for the Installation of Private Fire Service Mains and Their Appurtenances".
4. NFPA 25, 1992 edition, "Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems".
5. NFPA 26, 1998 edition, "Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection".

B. Sources: All Standards enforced are found in the City of Los Angeles and Los Angeles Fire Department amended copies of the Uniform Fire Code, 2001 edition, and the California Building Code 2001.

C. Codes: All work shall conform to the requirements of the applicable portions of the 2001 California Building Code (CBC), 2001 Uniform Fire Code (UFC) and 2001 Uniform Fire Code Standards as modified by City of Los Angeles and Los Angeles Fire Department. These requirements include but are not limited to:

1. 2001 CBC, Chapter 9, "Fire Protection Systems".
2. 2001 CBC, Standard 9-1, "Installation of Sprinkler Systems".
3. 2001 CBC, Standard 9-2, "Standpipe Systems".
4. 2001 UFC, Article 9, "Fire Department Access and Water Supply".
5. 2001 UFC, Article 10, "Fire-Protection Systems and Equipment".
6. 2001 UFC, Article 11, "General Safety Precautions".

D. Regulations: All Work and materials for sprinkler systems shall conform to all Federal, State, and Local codes and regulations governing this installation, including the current editions of the California Building Code and Fire Codes, Building and Fire Prevention Codes, as modified by the City of Los Angeles and Los Angeles Fire Protection.

E. Conflicts: If there is a conflict between the reference NFPA Standards, Federal, State, or local codes and this Section, it shall be the Contractor's and Fire Sprinkler Subcontractor's responsibility to bring the conflict to the attention of the Architect for resolution.

F. Costs and Fees: The Fire Sprinkler Subcontractor shall be responsible for filing all documents, paying all fees, and securing all permits, inspections, and approvals necessary for the completion of the Work of this Section.

G. Quality: All devices, systems equipment, and materials furnished and installed shall be new and shall be of types or models approved by the Architect, Owner, City of Los Angeles, Los Angeles Fire Department, and any other authority having jurisdiction.

H. Subcontractor Qualifications: The Fire Sprinkler Subcontractor shall:

1. Hold all licenses and obtain all permits necessary to perform work of this type in the City of Los Angeles.
2. Have at least five years experience in the installation of fire sprinkler systems of this type and be familiar with all applicable local, state and federal laws and regulations.
3. Be regularly engaged in the design, installation, testing and servicing of automatic fire sprinkler systems.

I. Supervision: Furnish services of a job site supervisor who shall be present at all times when Work of this Section is actively in progress.

1.05 WARRANTY AND EMERGENCY SERVICE:

A. Warranty: All Fire Sprinkler Equipment and Systems shall be warranted and guaranteed in accordance with Section 01790 during the installation and for a one year period after the final acceptance of the Work by the Owner. The Fire Sprinkler Subcontractor shall be responsible during the design, installation, testing, and warranty and guarantee periods for any damage caused by it (or its sub-subcontractors) or by defects in its (or its sub-subcontractors) work, materials, or equipment.

B. Emergency Service: During the installation and warranty period, the Fire Sprinkler Subcontractor shall furnish emergency repair service for the sprinkler system as requested by the Architect or Owner for such service. This service shall be provided on a 24 hour per day, seven days per week basis.

1.06 SPARE PARTS AND SPECIAL TOOLS: Conform to Section 01770 - Closeout Procedures and Submittals.

A. Spare parts and special tools shall be delivered to the Owner prior to final acceptance of the Work.

B. The Fire Sprinkler Subcontractor shall install metal spare head cabinets at the locations of the risers, and shall supply 24 spare sprinkler heads, per building, in an amount equal to each type of sprinkler head installed. These heads shall be placed in the spare head cabinets.

C. The Fire Sprinkler Subcontractor shall supply one Sprinkler Head Wrench, per building, for each type of Sprinkler Head installed.

PART 2 – PRODUCTS

2.01 GENERAL: All equipment and system components furnished and installed shall be new and of first quality and be listed by Underwriters Laboratories Inc. (UL) and approved by Factory Mutual (FM) for their intended use. All such equipment and system components shall be installed within limitations of the respective UL listings and FM approvals.

2.02 PIPE AND FITTINGS:

A. Sprinkler System Piping or Tubing: Shall meet requirements of NFPA 13. Fire Sprinkler Subcontractor shall base its bid on the use of any one or a combination of the following:

1. Schedule 10 Pipe meeting ASTM A53, A135, or A795 requirements with:

   a. Mechanical grooved pipe couplings and fittings for roll grooved pipe sizes 2-1/2 inches and larger.
   b. Pipe joined by welding in accordance with NFPA 13, Section 3-1.1.2.
   c. Mechanical tees or crosses which are sealed with elastomeric gaskets and are not joined by welding or roll grooves and plain end pipe for slip-on fittings shall not be used.

2. Schedule 40 Pipe meeting ASTM A53, A135, A795 requirements with:

   a. Threaded pipe couplings and fittings.
   b. Mechanical grooved pipe couplings and fittings for cut grooved pipe sizes 2-1/2 inches and larger.
   c. Pipe joined by welding in accordance with NFPA 13, Section 3-1.1.3.
   d. Mechanical tees or crosses which are sealed with elastomeric gaskets and are not joined by welding, pipe threads or cut grooves and plain end pipe for slip on fittings shall not be used.

3. SuperFlo pipe or equivalent meeting ASTM A135 requirements with grooved pipe couplings and fittings and piping specifically listed for such uses and installed in accordance with the manufacturers recommendations and listing requirements.

4. Copper Tube and Fittings: Shall not be used.

B. Underground Pipe: Shall be centrifugally cast ductile iron or plastic or other nonmetallic pipe specifically listed for such use and installed in accordance with the manufacturers recommendations and listing requirements. Underground pipe passing under footings shall be ductile iron. Installation shall be for Class 150 pipe and fittings.

C. Underground Pipe Fittings: Shall be "Tyton", "Fastite", or "Belltite" mechanical joint, short body fittings conforming to ANSI A21.10. Flanged fittings shall conform to ANSI 3161. Plastic or other nonmetallic pipe fittings may be used if specifically listed for such use and installed per manufacturer's recommendations and listing requirements.

D. Pressure Ratings of All Fittings: Shall meet or exceed maximum working pressures available within the system. The working pressures of the systems shall not exceed 175 PSI.

E. Protection: All piping and hangers where exposed to the weather or installed in a corrosive atmosphere shall be protected against corrosion.

2.03 CONTROL AND DRAIN VALVES:

A. Types: Sprinkler system control and drain valves shall be the following types:

1. Outside Screw & Yoke (OS&Y) gate valves.
2. Indicating Butterfly Valves (IBCV) that are approved for use in sprinkler systems.
3. Butterfly valves with integral valve supervisory switches, whose entire assembly is approved for use in sprinkler systems.
4. Inside screw gate valves with indicating posts (PIV).

B. Listing: All valves must be UL listed and FM approved for their intended use.

C. Water Supply Control Valves and Drain Valves: Shall be permanently marked with metal signs to show the sprinkler system zone which they serve.

D. Pressure Ratings of All Valves: Shall meet or exceed maximum working pressure available within the system. The system working pressure shall not exceed 175 psi.

E. Control Valves: Shall be locked and electrically supervised (tamper switch).

F. Locks: All valves shall be provided with a break away shackle lock (chain if required). All locks shall be keyed alike. Provide Owner with a minimum of 6 keys on ring appropriately marked.

G. Access Panels: Provide access panels (minimum size 12 inches by 12 inches) for all control valves located above finished ceilings or concealed in walls. Architect will select finish of access panels. Access panels shall be of fire resistive construction and shall be of a type to maintain the fire rating of assemblies.

H. Valve Placement: Control valves shall be readily accessible and located no higher than 5 feet above the finish floor serving the valve. Gate valves with wall posts (WPIV) or exterior post indicator valves (PIV) shall be used to control the supply to the main risers for each building. Indicating butterfly valves shall not be used on building risers. Control valves shall be accessible from outside the fire areas which they protect. See Drawings.

2.04 SPRINKLERS:

A. Types: Automatic sprinklers shall be of the following types:

1. Recessed pendent sprinklers, 1/2 or 17/32 inch orifice, with a chrome finish and glass bulb shall be installed in all areas with finished ceilings.
2. Upright sprinklers, 1/2or 17/32 inch orifice, with brass finish shall be installed in unfinished and warehouse areas.
3. Recessed sprinklers with metal covers matching the ceiling finish shall be installed in lobbies and exterior soffits.

C. Finishes: The Architect will select finishes for all automatic sprinklers and escutcheons from samples of available finishes submitted by Fire Sprinkler Subcontractor.

D. Lobbies: The type and location of the fire sprinkler in the lobbies shall be approved by the Architect. Location and spacing of the sprinklers in the lobbies will be based on the lighting, vaulted ceilings, and esthetics of the entries.

E. Manufacture: All sprinklers within a space shall be from the same manufacturer and have the same heat response element, including temperature rating and response characteristics.

F. Ratings: It shall be the Fire Sprinkler Subcontractor's responsibility to install sprinklers of the proper temperature rating as required by NFPA 13 and the AHJs.

G. Escutcheons: Shall be metal and be listed with the sprinklers for recessed sprinkler installation.

H. Orifices: All sprinklers shall be standard or larger orifice sprinklers unless otherwise specified.

2.05 IDENTIFICATION SIGNS: Furnish and install hydraulic calculation signs for each new sprinkler zone. Fire Sprinkler Subcontractor shall also provide identification signs for all valves installed under this Section.

A. Hydraulic Calculation Signs: Shall include all information indicated in the Appendix A, NFPA 13. Valve identification signs shall identify the function of the valve and the area served.

B. Type: Signs shall be rigid, flat steel or aluminum plaques with embossed enamel background and lettering. Signs shall be secured by chain or durable wire to each sprinkler zone control valve, or in an obvious location specifically approved by the Architect.

2.06 MISCELLANEOUS PRODUCTS: Pressure gauges shall be UL listed 3-1/2 inch minimum dial type gauges with a maximum limit of not less than twice the normal working pressure at the point installed. All gauges shall be provided with a shut off valve (gauge cock).

PART 3 - EXECUTION

3.01 WORKING CONDITIONS: The Fire Sprinkler Subcontractor's responsibility to inspect the Drawings and become familiar with the conditions under which the Work of this Section will be performed.

A. All work of this Section may be conducted during normal working hours.
B. The Fire Sprinkler Subcontractor shall be responsible for attending weekly construction coordination meetings with the Architect and/or Contractor.

3.02 PREPARTION FOR WORK:

A. The Fire Sprinkler Subcontractor shall coordinate with the Work of the other trades towards the general purpose of having the construction progress as rapidly and as smoothly as possible with a minimum of interference between trades.

B. Before the start of Structural Work, the Fire Sprinkler Subcontractor shall submit instructions for openings and penetrations required for its work to the Architect. Instructions shall be submitted for the Architect's approval. The Fire Sprinkler Subcontractor shall provide any subsequent additional penetrations, openings, or relocations required, not delineated in its instructions, at no additional cost to the Owner.

C. No work shall commence prior to approval of Shop Drawings by the Architect, Owner, City of Los Angeles, and Los Angeles Fire Department. Any change in Work which had been installed prior to approval of Shop Drawings shall be made without additional compensation to Contractor or Fire Sprinkler Subcontractor.

3.03 GENERAL INSTALLATION: Aesthetics and workmanship be a primary consideration when installing fire sprinklers and fire sprinkler piping. Any facet of the fire sprinkler installation that does not meet with the Architect's approval shall be revised by the Fire Sprinkler Subcontractor to the Architect's satisfaction. Pipe hangers shall be vertically plumb and piping runs shall be straight without deviation throughout its length. Workmanship shall be of the highest quality and the installation shall be clean, professional, and correct.

A. All holes made by the Firer Sprinkler Subcontractor in any wall, ceiling, or floor shall be patched by the Fire Sprinkler Subcontractor, restoring the wall, ceiling, or floor to its original condition, fire resistance and integrity.

B. The location of equipment, controls, piping, pumps, controller, valves and drains shall be submitted to the Architect for approval.
C. All sprinklers and equipment shall be installed in accordance with the manufacturer's instructions. All special tools recommended by the manufacturer shall be used.
D. Sprinklers permanently installed shall be installed with deflector to the ceiling distances in accordance with NFPA 13.

3.04 EXCAVATION AND BACKFILL: Perform all excavation of any and all materials encountered in the course of excavating for underground water supply piping. After the work is in place, tested, and accepted, backfill with approved granular fill and then with suitable earth, free from rocks, organic material, etc. All pipe trenches under slabs on grade shall be entirely backfilled with lake or bank run sand or approved granular fill.

A. Provide and maintain all bracing, shoring or sheeting to support the walls of excavations and protect personnel, to meet the requirements of OSHA and Title 8, CCR.
B. Earth excavation shall include clay, silt, sand, muck. gravel, hardpan, loose shale, and loose stone.
C. Where excavations in rock are required, excavate to a minimum over-depth of 4 inches below required trench depths.
D. Over-depths shall be backfilled with 1/4 inch granular material, thoroughly compacted.
E. Whenever unstable soil is encountered in the bottom of the trench, such soil shall be removed and the trench backfilled to the proper grade with coarse sand, fine gravel, or other suitable materials.
F. The bottom of the trench shall be rounded so that at least the bottom third of the pipe rests firmly on the undisturbed soil for as nearly its full length as proper jointing operations will permit.
G. This part of the excavation shall be done manually only a few feet in advance of the pipe laying, by a person skilled in this type of work.
H. Extra depth shall be cut for hubs or other enlarged joints.
I. Fire Sprinkler Subcontractor shall be responsible for all existing underground utilities. Existing location of all utilities shall be confirmed and protected. If damaged during excavation, Contractor shall replace to new condition any damage is done to utilities, at no cost to the Owner.
J. After installation and test of piping and equipment is completed, backfill all excavations carefully.
K. Excess from excavations shall be piled on the site or disposed of off site as directed by the Contractor.
L. Where existing surfacing and base course material is removed or damaged, replace with materials to match existing work, of the same respective thickness, type and densities as the material removed.

3.05 UNDERGROUND PIPE: Furnish and install underground fire protection water mains complete with all system components including fittings, thrust blocks and key operated gate valves, and as required by the AFJs. Show all underground pipe sized on Shop Drawings.

A. Contractor shall visit the site and determine by observation the nature of the soil and water conditions (both above and below ground) at its expense, and shall locate all utilities affecting the scope of work.
B. Underground pipe shall have a firm bearing along entire length.
C. Piping shall be evenly graded.
D. Invert elevations of underground piping shall be determined by instruments from established grades. The depth of bury shall not be less than 3 feet from finished grade to top of pipe barrel. Coordinate the installation with existing utilities.
E. Thrust blocks shall be in accordance with NFPA 24 requirements and be constructed at all changes of direction, tees, and at end of mains.
F. Fittings used for vertical changes in alignment shall be restrained by uplift anchors. Tie rods shall be installed and coated with rust protecting materials.
G. Prior to backfilling, all exposed metal surfaces shall be thoroughly coated with bituminous seal coat.

3.06 PIPING: All sprinkler piping installed in public areas or non-public areas with suspended ceilings shall be concealed in the walls, ceiling, or soffits. Pipe in unfinished areas may be exposed.

A. All exposed pipe which passes through a wall, ceiling or floor shall be provided with escutcheon plates. This includes inspectors test and drain lines piped to the building exterior.
B. All exposed piping and devices shall be installed as high as possible, but no less than 7 feet 0 inches above the finished floor in traffic or working areas and so as not to obstruct any portion of a window, doorway, stairway, or passageway and not interfere with the operation or accessibility of mechanical, plumbing, or electrical equipment.
C. Valves controlling water supply to the sprinkler system shall be less than 5 feet 0 inches above finished floor or finished surface. When specifically approved by the Architect, they may be higher if they are provided with operating chains.

D. The Fire Sprinkler Subcontractor shall furnish the Architect approved adequate permanent protection for any installed piping, valves, devices or accessories which, in Architect's opinion, are subject to physical damage or may be a hazard.

E. Sealant: Pipe which passes through fire resistive barriers (including shaft walls) shall be sleeved and grouted or sealed to maintain the integrity and rating of the fire resistive barrier.

3.07 SYSTEM TEST AND DRAIN CONNECTIONS:

A. Fire Sprinkler Subcontractor shall provide all test and drain connections as required by NFPA 13 and the Local AHJ. Test valves shall test both the local alarm and the remote monitoring devices. Test valves must be on the system side of the flow switches.

B. Test connections and drain connections shall be hard piped to discharge waste water directly into floor or approved location. The Fire Sprinkler Subcontractor shall route the pipe and modify any floor drain grates as necessary to minimize splashing due to discharge. In locations where the Architect allows, the drain may discharge with a down tuned elbow at the building exterior. In these locations, Fire Sprinkler Contractor shall provide a concrete splash block to protect landscaping. Where possible the Inspector's Test connections for each building shall be piped to a common location and shall be located directly adjacent to an exterior door.

3.08 RISERS:

A. Fire Sprinkler Subcontractor shall locate main risers and standpipes for the sprinkler system in order to minimize obstructions to traffic or building operations. Exact locations of risers shall be approved by the Architect. Approximate riser locations are shown on the Architectural, Fire Protection, and Civil Drawings. Risers shall utilize gate valves with indicating posts (PIV'S).

B. Zoning: The fire sprinkler system shall be zoned on a per floor basis and divided into zones for each system.

3.09 FLUSHING AND SANITIZATION: Prior to connecting the roof sprinkler piping to the underground fire main, the Fire Sprinkler Subcontractor shall flush the underground fire main in accordance with NFPA 13, City of Los Angeles, and Los Angeles Fire Department standards. The Contractor shall notify the Los Angeles Fire Department prior to flushing.

3.10 SEISMIC CONSIDERATIONS: Sprinkler piping may cross building structural separations such as expansion joints and seismic joints provided that the pipe is specifically designed with flexible connections at each crossing able to accommodate the calculated differential motions during an earthquake. All required structural differential movement and drift calculations shall be prepared by a licensed engineer in the State of California, at no additional expense to the Owner.

3.11 SWAY BRACING, FLEXIBLE COUPLINGS, AND HANGERS: All flexible couplings, hangers and sway bracing shall be designed and installed as required by NFPA 13 (including all appendices). Sway Brace calculations shall be provided for all braces. Flexibility, internal pressure, and differential movement between piping and building, earth, or other supporting structural members shall be allowed for, so that no allowable stress is exceeded.

3.12 FINAL INSPECTION AND TEST:

A. The Fire Sprinkler Subcontractor shall make arrangements with the Architect for final inspection and witnessing of the final acceptance tests. The Architect will conduct the final inspection and witness the final acceptance test. This test may separate from the testing by the local authorities.

B. Required Tests: All tests and inspections required by the referenced codes and standards, the City of Los Angeles, Los Angeles Fire Department, and the Architect shall be performed by Fire Sprinkler Subcontractor under this scope of Work.

1. When local code authorities are required to witness a test, the Fire Sprinkler Subcontractor shall be responsible for making necessary arrangements with the authorities and coordinating the testing with the Architect.
2. Fire Sprinkler Subcontractor shall be responsible for obtaining all test documents with necessary approval stamps and signatures of the inspecting authority. The Fire Sprinkler Subcontractor shall submit one copy of each of these documents to the Architect.
3. Fire Sprinkler Subcontractor shall furnish all tools and instruments necessary for required testing.
4. Notice: Fire Sprinkler Subcontractor shall give at least seven (7) working days notice for all tests.

C. Final Approval: Final approval of the Work will be given by the Architect when:

1. The completed sprinkler system have been inspected, tested and approved by the Architect, City of Los Angeles, and Los Angeles Fire Department.
2. Required submittals, system operation and maintenance Manuals, Record Documents, spare parts and special tools have been furnished, reviewed and approved by the Architect.
3. The Architect will visit the job site to observe the work and witness final acceptance tests when so advised by the Contractor that the Work is completed and ready for test. If the work has not been completed or the test is unsatisfactory, the Contractor shall be responsible for the Architect's extra expenses for reinspection and witnessing retesting of the work. Such extra fees will be deducted from payments by the Owner to the Contractor.

3.13 RECEIVING AND HANDLING: The Fire Sprinkler Subcontractor shall be responsible for all receiving, handling, and storage of its materials at the job site. Use of loading docks and service drives shall be coordinated with the Owner and Contractor.

3.14 RUBBISH REMOVAL: The Fire Sprinkler Subcontractor shall remove all rubbish and debris resulting from work of this Section, on a daily basis, from the job site. Rubbish not removed by the Fire Sprinkler Subcontractor may be removed by Owner or Contractor and backcharged to the Fire Sprinkler Subcontractor.

END OF SECTION

SECTION 15402

DOMESTIC WATER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide domestic water systems, complete.

A. Work In This Section: Principal items include:

1. Hot water heaters.
2. Piping.
3. Required connections to plumbing fixtures and equipment requiring same.

B. Related Work:

1. Section 15042: Air and Water Test and Balance
2. Section 15047: Identification
3. Section 15160: Vibration Isolation
4. Section 15180: Mechanical Insulation

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Piping.
2. Valves.
3. Water hammer arresters.
4. Relief valves.
5. Hot water heaters.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Domestic Water Piping: Piping shall be Schedule "B" and "F" as specified in Section 15050 and as appropriate for the pressure existent in the system at point of application.

B. Drain Valves: Heavy rough cast brass faucets with composition washer and 3/4" hose end.

C. Water Hammer Arresters: Properly sized water hammer arresters, located and sized in accordance with PDI-WH-201 Standards, J.R. Smith No. 5005 or same type and quality by Josam or Zurn.

D. Hot Water Heaters: Tank capacity and heater size as shown on schedule.

1. Tank: Internal fusing glass lined 150 psi working pressure, equipped with extruded magnesium anode, jacketed and insulated to meet ASHRAE 90-75 standards, 3 year warranty for commercial use.
2. Control: Immersion type adjustable thermostat and high limit control (strap-on or contact type are not acceptable), and gas valve with 100% safety feature.
3. Support: Mount heater on heavy gauge galvanized steel drip pan 3" high on all sides.
4. Acceptable Manufacturers: A.O. Smith, National, Lochinvar.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION: Piping installation shall be made in accordance with Section 15050. Pressure testing shall be in accordance with Section 15042.

A. Insulation: Piping insulation shall be as specified in Section 15180 Mechanical Insulation.

B. Piping: Free of traps. Grade and valve for complete control and drainage of system with drain cocks at low points and base of valved risers.

1. Connections to equipment:
   a. Flanges or unions.
   b. Threaded adapters used for swing connections.
2. Shut-Offs: Install gate valve in each riser and branch line where branch takes off from main, at connections to equipment, and as shown to isolate sections of piping and fixtures for repairs.
3. Dielectric Insulators: Provide dielectric insulators between dissimilar metals.
4. Terminal plugged or capped connections in threaded plug or threaded nipple and cap as required.

C. Water Hammer Arresters: Water hammer arresters shall be located and sized in accordance with PDI-WH-201.

3.02 DISINFECTING OF WATER SYSTEMS: Disinfect all hot and cold water systems.

A. Supervision and Testing: Perform disinfecting under the observation of the Architect. Give two days notice. Disinfecting shall be subject to written approval upon receipt of satisfactory laboratory test results.

B. Certification: Submit a certificate stating (1) system capacity, (2) the disinfectant used, (3) time and rate applied, and (4) resultant residuals in parts per million at completion of Work.

C. Disinfecting Agent: Use chlorine gas aqueous carrier, type approved by the Architect, for water system disinfecting with approved chlorinator.

D. Preparation:

1. Service Cock: Provide service cock or valve within three 3-feet of supply main for introducing disinfecting agent for lines.

2. Flushing: Leave each fixture or outlet wide open after pressure tests until flow shows only clear water.

3. Domestic Hot Water Temperature: Reduce to that of cold water system during the disinfecting procedure.

E. Procedure:

1. Flushing: With system full of water and under "main" pressure, open all outlets.
2. Inject disinfectant through a service cock at slow, even continuous rate until orthotolidine test at each outlet shows chlorine residual concentration of more than 50 parts per million (ppm).
3. Close all outlets and valves including service valve at main and injection cock. Maintain for 24 hours.
4. Orthotolidine test, after 24 hour period, shall indicate minimum chlorine residual concentration of 50 ppm. If not, repeat disinfecting procedure.
5. After satisfactory completion of the above test, flush out the system until orthotolidine tests show maximum chlorine residual of 0.5 ppm.

F. Preliminary Approval: After satisfactory completion of the disinfecting procedure, inspector may issue a temporary approval for immediate human use of the piping system pending bacteriological analysis of water samples.

G. Bacteriological Analysis of Water: After final flushing, analyze water samples to test negative for coli-aerogene organisms. Analysis shall indicate total plate count less than 100 bacteria per cc, or equal, to control sample.

H. Final Approval: If analysis results are not satisfactory, repeat entire disinfecting procedure until specified standards are met.

3.03 BACKFLOW PROTECTION:

A. Protection: Plumbing fixtures, faucets with hose connections, and all other equipment having plumbing connection shall have their water supplies protected against all possible back-siphonage.

B. Testing: Arrange for testing the backflow devices as required by the local health authorities, and the Architect.

END OF SECTION

SECTION 15414

DRAINAGE SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide drainage systems, complete.

A. Work In This Section: Principal items include:

1. Complete sanitary waste and vent systems including:
   a. Connections to existing sanitary sewer as indicated.
   b. Drains.
   c. Plugged outlets.
   d. Connections to plumbing fixtures and equipment requiring same.

B. Related Work:

1. Air and Water Test and Balance: Section 15042.
2. Mechanical Insulation: Section 15180.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Floor drains.
2. Floor sinks.
3. Roof drains.
4. Cleanouts
6. Valves.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Piping systems shall be as specified in Section 15050. Piping materials shall be in accordance with the following:

1. Sanitary waste and vent piping: Schedule "C".
2. Storm drainage piping: Schedule "C".

B. Cleanouts: Cleanouts shall be as specified, or approved equal, by J.R. Smith or Josam. Cast brass, full size up to 4" and at least half size for larger pipes with 4" minimum.

1. In or back of walls and partitions: Cast bronze plugs with stainless steel wall plates; similar to J.R. Smith 4477.
2. Piping buried under floor: Extend and terminate with cast deck plates with caulked connections; similar to J.R. Smith 4890.
3. Piping buried under membrane waterproofed floors: With flashing flange and clamping ring, brass taper thread CO plug, adjustable cast extension neck; similar to J.R. Smith 4223.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Installation and Piping: Piping installation shall be made in accordance with Section 15050. Slope horizontal drainage piping 3" and smaller 1/4" per foot. Slope horizontal drainage piping 4" and larger 1/4" per foot or 1/8" per foot where indicated and approved by the City of Los Angeles. Make all changes in direction of drainage piping by use of 45° wyes, long turn tee wyes, long sweep quarter bends, sixth, eighth, or sixteenth bends. Short turn sanitary tees permissible on horizontal to vertical where space conditions require.

B. Installation of Cleanouts: In accordance with the California Plumbing Code 2001 and as indicated. All cleanouts shall be accessible. Graphite shall be used on all cleanouts with threads thoroughly greased after acceptable pressure test.

C. Trap Seal Maintenance: Provide automatic trap primer protection for all floor drains and sinks not receiving a sufficient and frequent flow to insure a continuous trap seal.

D. Insulate all horizontal drainage piping in plenums from floor sinks receiving condensate from air conditioning equipment.

END OF SECTION

SECTION 15430

PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section

A. Work Included: This Section includes plumbing specialties for the following:

1. Water distribution systems.
2. Soil, waste, and vent systems.
3. Storm drainage systems.

B. Related Sections:

1. Section 15050, "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, basic installation requirements, and labeling and identifying requirements; and escutcheons, dielectric fittings, sleeves, and sleeve seals that are not in this Section.

2. Section 15047, "Identification" for labeling and identifying requirements.

1.02 SYSTEM PERFORMANCE REQUIREMENTS: Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

A. Water Distribution Piping: 125 psig.
B. Soil, Waste, and Vent Piping: 10-foot head of water.
C. Storm Drainage Piping: 10-foot head of water.
D. Force-Main Piping: 100 psig.

1.03 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:

1. Backflow preventers.
2. Water regulators.
3. Balancing valves.
4. Strainers.
5. Water hammer arresters.
6. Trap seal primer valves and systems.
7. Drain valves.
8. Hose bibbs, hydrants, and sanitary post hydrants.
9. Outlet boxes and washer-supply outlets.
10. Hose stations.
11. Backwater valves.
12. Cleanouts.
13. Floor drains, open receptors, and trench drains.
14. Vent caps, vent terminals, and roof flashing assemblies.
15. Roof drains.
16. Oil interceptors and solids interceptors.
17. Sleeve penetration systems.

B. Reports: Specified in "Field Quality Control" Article.

C. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include the following:

1. Backflow preventers.
2. Water regulators.
3. Water filters.
4. Thermostatic water mixing valves and water tempering valves.
5. Trap seal primer valves and systems.

6. Hose stations.
7. Sanitary hydrants.
8. Backwater valves.
9. Grease interceptors, grease recovery units, oil interceptors, oil storage tanks, solids interceptors.

1.04 QUALITY ASSURANCE:

A. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Section 01630 "Substitution Procedures".

B. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.

C. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.

1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

D. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

E. Comply with NFPA 70, "National Electrical Code," for electrical components.

F. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.

1.05 EXTRA MATERIALS: Refer to Section 01770. Deliver extra materials to Owner. Furnish extra materials described below that match the products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

A. Water Filter Cartridges: Furnish quantity not less than 200 percent of amount of each type and size installed.

B. Operating Key Handles: Furnish one extra key for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Backflow Preventers:
   Ames Co., Inc.
   Cla-Val Co.
   CMB Industries; Febco Div.
   Grinnell Corp.; Mueller Co. Marketing Group for Hersey Products Div.
   Watts Industries, Inc.; Water Products Div.
   Zurn Industries, Inc.; Wilkins Div.

2. Water Regulators:
   Cla-Val Co.
   Watts Industries, Inc.; Water Products Div.
   Zurn Industries, Inc.; Wilkins Div.

3. Calibrated Balancing Valves:
   Amtrol, Inc.
   Armstrong Pumps, Inc.
   ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
   Taco, Inc.
   Watts Industries, Inc.; Water Products Div.

4. Memory-Stop Balancing Valves:
   Crane Co.; Valve Div.
   Grinnell Corp.
   Hammond Valve Corp.
   Milwaukee Valve Co., Inc.
   Nibco, Inc.

5. Water Tempering Valves:
   Conbraco Industries, Inc.
   Heat-Timer Corp.
   Holby Valve Co., Inc.
   Honeywell Braukmann.
   IMI Cash Valve.
   Leonard Valve Co.
   Sparco, Inc.
   Watts Industries, Inc.; Water Products Div.

6. Hose Stations: Acorn.

7. Water Hammer Arresters: Jay R. Smith Mfg. Co.

8. Trap Seal Primer Valves:
   Precision Plumbing Products, Inc.
   Jay R. Smith Mfg. Co.

9. Trap Seal Primer Systems: Precision Plumbing Products, Inc.

10. Backwater Valves: Jay R. Smith Mfg. Co.

11. Roof Flashing Assemblies: Elmdor/Stoneman Manufacturing Co.

12. Sleeve Penetration Systems: ProSet Systems, Inc.

2.02 BACKFLOW PREVENTERS:

A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. 2-Inch NPS and Smaller: Bronze body with threaded ends.
2. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
   a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.
3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Polished chrome-plate if used in chrome-plated piping system.
5. Strainer on inlet, if indicated.

B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, floating disc and atmospheric vent.

C. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and 2 independent check valves with intermediate atmospheric vent.

D. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; and test cocks with 2 positive-seating check valves.

1. Pressure Loss: 5 psig maximum, through middle one-third of flow range.

E. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: 5 psig maximum, through middle one-third of flow range.

F. Dual-Check-Valve-Type Backflow Preventers: ASSE 1024, suitable for continuous pressure application. Include union inlet and 2 independent check valves.

1. Pressure Loss: 12 psig maximum, through middle one-third of flow range.

G. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; 2 positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer.

1. Pressure Loss: 5 psig maximum, through middle one-third of flow range.

H. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head back pressure. Include 2 check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7 garden-hose thread on outlet.

I. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

2.03 WATER REGULATORS:

A. General: ASSE 1003, water regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include an integral factory-installed or separate field-installed Y-pattern strainer.

1. 2-Inch NPS and Smaller: Bronze body with threaded ends.
2. 2-1/2-Inch NPS and Larger: Bronze or cast-iron body with flanged ends. Include AWWA C550 or FDA-approved interior epoxy coating for regulators with cast-iron body.
3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Polished chrome-plate if used in chrome-plated piping system.

B. Type: Single-seated, direct-operated type; single-seated, direct-operated, integral-bypass type; or pilot-operated type, single- or double-seated, cast-iron-body main valve, with bronze-body pilot valve.

2.04 BALANCING VALVES:

A. Calibrated Balancing Valves: Adjustable, with 2 readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.

1. 2-Inch NPS and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate and threaded or solder-joint ends.
2. 2-Inch NPS and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
3. 2-1/2-Inch NPS and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, 2-Inch NPS and Smaller: MSS SP-110, ball valve, rated for 400-psig minimum CWP. Include 2-piece, ASTM B62 bronze body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, solder-joint ends, and vinyl-covered steel handle with memory-stop device.

2.05 STRAINERS:

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig minimum steam working pressure, unless otherwise indicated.
2. 2-Inch NPS and Smaller: Bronze body, with female threaded ends.
3. 2-1/2-Inch NPS and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved epoxy coating and flanged ends.
4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.
   a. Drain: Factory- or field-installed, hose-end drain valve.
5. T-Pattern Strainers: Malleable-iron or ductile-iron body with grooved ends; access end cap with drain plug and access coupling with rubber gasket.
6. Basket Strainers: Bolted flange or clamp cover, and basket with lift-out handle.
   a. Duplex Type: Double unit, with bronze or stainless-steel diverter valve and 2 baskets.
   b. Drain: Factory- or field-installed, hose-end drain valve.

B. Drainage Basket Strainers: Non-pressure-rated, cast-iron or coated-steel body; with bolted flange or clamp cover and drain with plug.

1. Basket: Bronze or stainless steel with 1/8- or 3/16-inch- diameter holes and lift-out handle.
2. Female threaded ends for 2-inch NPS and smaller, and flanged ends for 2-1/2-inch NPS and larger.

2.06 TRAP SEAL PRIMER VALVES:

A. Trap Seal Primer System: Factory-fabricated, automatic-operation assembly for wall mounting with the following:

1. Piping: 3/4-inch NPS, ASTM B 88, Type L; copper, water tubing inlet and manifold with number of 1/2-inch NPS outlets as indicated.
2. Cabinet: Steel box with stainless-steel cover.
3. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V, ac power.
4. Water Hammer Arrester: ASSE 1010.
5. Vacuum Breaker: ASSE 1001.

2.07 BACKWATER VALVES:

A. Horizontal Backwater Valves: ASME A112.14.1, cast-iron body, with removable bronze swing-check valve and threaded or bolted cover.

B. Open-Position Check Valve: Factory assembled or field modified to hang open unless subject to backflow condition.

C. Extension: ASTM A74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor, instead of cover.

2.08 MISCELLANEOUS PIPING SPECIALTIES:

A. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI-WH 201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes A through F and PDI-WH 201 sizes A through F.

B. Hose Bibbs: Bronze body, with renewable composition disc, 1/2- or 3/4-inch NPS threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker.

1. Finish: Chrome or nickel plated.
2. Operation: Operating-key (handle) type. Include operating key

C. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

1. Vent Cap: Extended model with field-installed, vandal-proof vent cap.

D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

E. Air-Gap Fittings: ASME A112.1.2, cast iron or cast bronze, with fixed air gap, inlet for drain pipe or tube, and threaded or spigot outlet.

F. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

G. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing, of size and end types corresponding to connected piping.

2.09 SLEEVE PENETRATION SYSTEMS:

A. A. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

B. Stack Fitting: ASTM A48, cast-iron, stack fitting with neoprene O-ring at base and cast-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

2.10 FLASHING MATERIALS:

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

B. Burning: 6 lb/sq. ft. or 0.0937-inch thickness.

PART 3 - EXECUTION

3.01 PLUMBING SPECIALTY INSTALLATION: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.

A. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

B. Install wall hydrants with integral or field-installed vacuum breaker.

C. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

D. Install backwater valves in building drain piping as indicated. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

E. Install expansion joints on vertical risers, stacks, and conductors as indicated.

F. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:

1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping 4-inch NPS and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

3.02 CONNECTIONS:

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing specialties and piping specified in other Division 15 Sections.

B. Interceptor Connections: Connect piping, flow-control fittings, and accessories as indicated.

C. Oil Interceptors: Connect inlet, outlet, vent.

3.03 CLEANOUT SCHEDULE

A. Cleanout CO: Where plumbing specialties of this designation are indicated, provide products complying with the following: Smith: Jay R. Smith Mfg. Co.

3.04 FLOOR-DRAIN SCHEDULE: Refer to Plumbing Fixture Schedule.

3.05 ROOF-DRAIN SCHEDULE: Refer to Plumbing Fixture Schedule.

END OF SECTION

SECTION 15447

ELEVATOR SUMP PUMPS

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide an Ebara Model 50DVSU6.25, 1/3 HP, 115 Volt/Single Phase, Submersible Sewage Ejector or equal approved in accordance with Section 01630, SP-1 and SP-2.

A. Duplex Submersible Sewage Ejectors:

1. Pump Casing, End Bell and Motor shell: Cast Iron
2. Impeller: Vortex Type, Cast Iron.
3. Shaft: 400 Series Stainless Steel.
4. Bearing: Prelubricated ball bearing.
5. Seal:
   a. Dual opposed mechanical seal located completely out of the pumpage, running in a separate oil filled chamber.
   b. Lower seal faces shall be silicon carbide running against silicon carbide, upper side: shall be silicon carbide running against silicon carbide.
6. Motor:
   a. Air-filled, Insulated Class F, 2 Pole, rated for continuous duty.
   b. Built-in overload.
7. Capacity: Pumps shall be rated for 10 GPM @ 10-foot TDH.

B. Control Panel and Level Controls:

1. Control Panel: Provide as indicated an industrial grade UL Listed 508 duplex control panel with a NEMA 1 enclosure. Panel shall be factory wired and tested in strict accordance with UL testing procedures for UL Listed 508 control panels. All control switches, test buttons and alarm silencing switches shall be mounted on exterior door of enclosure and shall include the following:

   a. Individual fused disconnect switches with lockout handle.
   b. Magnetic starter with OL.
   c. Test - Off - Automatic selector switch.
   d. Green pump running lights.
   e. OL reset buttons.
   f. Alarm horn mounted on panel.
   g. Alarm horn silencing switch.
   h. Dry contacts for remote alarm.

2. Float Switches: Provide as shown 3 UL Listed mercury float switches complete with stainless steel float mounting support pole. The cables shall be secured to the support pole in accordance with the manufacturer's installation instructions.

C. Basin: Basins shall be City of Los Angeles approved fiberglass with reinforced walls and anti-floatation ring. Provide a steel cover plate and frame with access plate as indicated. Basin dimension shall be 30" diameter x 30" deep.

END OF SECTION

SECTION 15450

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide plumbing fixtures, complete.

A. Work In This Section: Principal items include:

1. Plumbing fixtures.
2. Plumbing supply fixtures.
3. Fixture supports.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Plumbing fixtures
2. Plumbing supply fixtures.
3. Fixture supports.

B. Shop Drawings:

1. Fixture backing.
2. Roughing-in drawings.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Fixtures shall be free from imperfections, true as to line, angles, curves and color; smooth, watertight, and practically noiseless in operation.

1. All fixtures, specified to be of vitreous ware, shall be fired vitreous chinaware of the best quality, nonabsorbent and burned so the whole mass is thoroughly fused and vitrified producing a material white in color, which when fractured will show a homogeneous mass, close-grained and free from pores. The glazed and vitreous china fixtures shall be white, thoroughly fused and united to the body, without discoloration chips, or flaws and shall be free from cracks. Warped or otherwise imperfect fixtures will not be acceptable.
2. Exposed pipe, fittings, traps, escutcheons, valves, valve handles and accessories, above and below fixtures:
   a. CP brass.
   b. Set screw cast brass escutcheons for piping.
   c. Traps: Cast brass with cleanout plugs.
   d. Covering tubes not permitted.
3. Supply fixtures with:
   a. Renewable seats or replaceable internal units.
   b. Composition washers.
   c. All metal indexed handles.
   d. Screwdriver or lockshield stops.

B. Plumbing fixture, trim and accessories shall be of manufacturer as follows. Refer to Section 01230 - Alternates:

1. Fixtures: American Standard, Kohler or Eljer. Battery operated, sensor type lavatory faucet shall be provided as an "Add Alternate.
2. Flush Valves: Sloan flush valves at water closets and urinals shall be battery operated, sensor type (Add Alternate).
3. Seats: American Standard, Kohler, Church or Olsonite are acceptable.
4. Supplies: American Standard, Chicago Faucet, Kohler or Bobrick.
5. Stops: American Standard, Chicago Faucet, Kohler, Bobrick or Brasscraft.
6. Traps: American Standard or Kohler.

7. Fixture Supports: Smith, Zurn or Josam.
8. Electric Water Coolers: Sunroc, Halsey Taylor or Haws stainless steel finish.

C. Approvals: Fixtures and trim designated for the physically handicapped shall have prior approval of the applicable section of California Code of Regulations prior to submission to the Architect. The submission shall contain proof of the required State approvals.

D. Fixtures: Refer to Fixture Schedule on the Drawings.

PART 3 - EXECUTION

3.01 FIXTURE INSTALLATION: Installation of fixtures shall be as recommended by the fixture manufacturer except as indicated differently. Set fixtures level and equally spaced when installed in bank of more than two. Rough-in supplies level, equally spaced and symmetrical with the fixture. Rough-in wastes in alignment with the fixture drain. Offsetting trap and waste will not be acceptable. Install flush valves level with flush connections vertically; offsetting and misalignment will not be acceptable.

A. Grouting: Grout all wall and floor mounted fixtures watertight where fixture is in contact with wall or floors.

B. Caulking: Caulk all deck mounted trim at the time of assembly, including fixture and casework mounted. Caulk all self-rimming sinks installed in casework.

C. Trim: Makeup trim with care and with the proper tools in order that no tool marks show after installation.

END OF SECTION

SECTION 15620

COILS

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide boils, complete.

A. Work Included:

1. Hot-water air coils.
2. Chilled-water air coils.
3. Refrigerant air coils.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 15700 – Wet Heat Transfer.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Shop Drawings including, but not limited to, the following:
1. Manufacturer's name and model number.
2. Identification as referenced in the documents.
3. Capacities/ratings.
4. Flow rate and pressure drop.
5. Materials of construction.
6. Dimensions and weights.
7. Manufacturer's installation instructions.
8. All other appropriate data.

1.03 DESIGN CRITERIA: This Section covers coils in factory packaged or custom air handling units and field erected air handling units. Coil sizes, capacities, configuration and operating characteristics shall be as shown on the Drawings and/or as scheduled. Coil performance data shall be certified in accordance with ARI Standard 410. Unless otherwise noted, temperature profile of discharge air from entire coil face shall be uniform within 12" of coil face. Header split or face split design will not be accepted.

1.04 CORROSION PROTECTION COATING: Where coils are specified to be corrosion protection coated, protect coils with coating similar to Heresite P-413 baking phenolic with plasticizer. Apply coating by 4 consecutive total immersions. After each of first 3 immersions, coating shall be partially cured in oven. Following fourth immersion and 1 spray coat, coating shall be totally cured in oven.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: Buffalo, Carrier, McQuay, Trane, Marlo, Heatcraft, RAE, or Temtrol.

2.02 HOT WATER COILS:

A. Coils shall be constructed of 0.024" tube wall, 1/2" or 5/8" OD seamless copper tubes with aluminum fins suitable for working pressures to 200 psig and temperatures to 220°F. Coils shall be tested at 250 psig under water.
B. Coil fins shall be continuous serpentine or plate fin type.
C. Coil headers shall be cast iron with tubes expanded into headers, steel pipe with brazed tube connections, or heavy seamless copper with tubes brazed to header.
D. Casings shall be minimum 16 gauge galvanized steel having galvanized steel end supports and top and bottom channels of rigid construction with allowance for expansion and contraction of finned tube section.
E. Coils shall be equipped with bronze spring turbulators where required to provide capacities indicated.

2.03 CHILLED WATER COILS:

A. Coils shall be constructed of 0.024" tube wall, 1/2" or 5/8" OD seamless copper tubes with aluminum fins suitable for working pressures to 200 psig. Coils shall be tested at 250 psig under water.
B. Coil fins shall be continuous plate fin type.

C. Coil headers shall be constructed of cast iron with tubes expanded into headers, steel pipe with brazed tube connections, or heavy seamless copper with tubes brazed to header.
D. Casings shall be minimum 16 gauge galvanized steel having galvanized steel end supports and top and bottom channels of rigid construction with allowance for expansion and contraction of finned tube section.
E. Select coils for tube velocity not less than 3.0 fps.
F. Maximum allowable fin spacing shall be 10 fins per inch. Coil depth shall not exceed 8 rows.

PART 3 - EXECUTION

3.01 GENERAL:

A. Install coils as indicated on drawings and/or as detailed. Pitch coils for proper drainage according to manufacturer's installation instructions. Install shims as required.
B. Clean oil film from coil fins with hot water/detergent as recommended by coil manufacturer.
C. Comb out fins when bent or crushed before enclosing coils in housing. Clean dust and debris from each coil to ensure its cleanliness.
D. Provide offsets in piping to facilitate coil removal. Unless otherwise specified, pipe coils for counter flow arrangement.
E. Install piping flexible connections and/or piping vibration isolation supports as specified in Section 15550 - Vibration Isolation.
F. Provide piping flexible connections at floor mounted coils.
G. Provide air vent and drain valve at each water coil.
H. Pipe condensate pan to nearest drain with trap.

END OF SECTION

SECTION 15650

WATER TREATMENT

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide water treatment, complete.

A. Related Work Not In This Section:

1. Vibration Isolation and Seismic Restraint: Section 15160.
2. Mechanical Insulation: Section 15180.
3. Domestic Water System: Section 15402.
4. Wet Heat Transfer: Section 15700.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Water treatment.
2. Water treatment program.

PART 2 - PRODUCTS

2.01 WATER TREATMENT:

A. General: Include Shop Drawings and manufacturer's reference data in the submittals required above.

B. Water Treatment Subcontractor shall provide the following:

1. Services for one year.
2. Chemicals.
3. Equipment.
4. Testing Equipment.
5. Warranties.

C. Procedures:

1. Water Treatment Subcontractor shall visit and test all cooling, heating, and process water systems, both open and closed, at least once a month.

2. A report of the existing water conditions and suggested corrective measures shall be submitted at the completion of each visit.

3. If scale or biological growths ("fouling") occur in any system, the Water Treatment Subcontractor shall furnish all labor and provide chemicals to bring the system to an acceptable level at no additional cost to the Owner, during normal working hours.

4. Log sheets and instructions shall be furnished for Owner's personnel.

5. The Water Treatment Subcontractor shall supervise installation of all water treatment equipment. and cleaning of open and closed systems with written certification of cleanliness upon completion.

D. Chemicals: The Water Treatment Subcontractor shall furnish all necessary and proper chemicals to operate the complete systems for a period of one year from initial operation. The following shall be included:

1. Cleaning chemicals, in liquid form, for the cleaning of the open and closed systems.
2. Where pH controller is specified, sulfuric acid shall be used unless sulfate content of the makeup water available does not permit its practical usage, in which case, Water Treatment Subcontractor shall suggest an alternative acid. A pH between 7.2 - 7.8 shall be maintained.
3. A corrosion inhibitor with sequestering properties shall be used in all tower systems, with acid and no acid.

E. Closed systems, other than aerated systems, shall be treated with a borate nitrite compound. The following residuals shall be maintained:

1. 700 - 1200 ppm nitrite in chilled water systems.
2. 1000 - 1500 ppm nitrite in hot water systems.

F. Controller: Shall have the following capabilities:

1. The ability to control the pH of the condenser water.
2. The ability to monitor and control the conductivity of the condenser water.
3. Manufacturer: Uniloc of Lakewood Instruments.

G. Chemical Pumps: All pumps shall exceed the pressure of the condenser water circulating pumps by 20%. There shall be relief valves on each pump. All drive parts shall be totally enclosed and designed for a corrosive environment. Manufacturer shall be liquid Metronics. Feed rates for each of these pumps shall be designed to easily feed the system at full tonnage.

H. Solenoid Valves: Controller shall be provided with solenoid valve with a working pressure not less than 20% above that of the condenser water circulating pumps. The valve shall be designed such that the system can be run at two cycles of concentration under unusual condition of acid feed failure running full tonnage. The valve shall be made of corrosion resistant metals.

I. Tanks: One 50 gallon polythylene tank shall be supplied with covers. The tanks shall be self supporting and shall have 5-gallon graduations.

J. Manufacturing Compliance: All analytical measurement instruments shall be of one manufacturer including sensors, electrodes, and associated electronic. In addition, the entire control and chemical feed package shall be assembled and tested as a complete unit by the manufacturer on the analytical measurement instruments.

K. Warranty: All equipment and goods shall be warranted to be free from defects in materials and workmanship for a period of 12 months in accordance with Section 01790.

L. Start-Up: Start-up supervision of all equipment shall be performed by a service engineer factory trained by equipment manufacturer. Owner's operator training shall also be furnished.

M. Test Equipment: Furnish all necessary testing equipment and kits for the proper chemical control of all treated water systems.

1. Supply a pH test kit with slide, as made by Taylor.
2. A hand DS meter with a visual scale calibrated in micromohs from 0-5000 as the Myron L Model 512M5.
3. A test kit to measure the corrosion inhibitor used in the tower (open side).
4. A test kit to measure the corrosion inhibitor in the closed systems.
5. Furnish one test kit for each kind of inhibitor used, if more than one type of corrosion inhibitor is used for the closed system.

2.02 HEATING HOT WATER TREATMENT: Provide a 12 gallon pot feeder with a working pressure which exceeds the hot water pumps by 20%.

PART 3 - EXECUTION

3.01 CLEANING OF PIPING SYSTEMS AND WATER TREATMENT: Condenser water and hot water heating piping systems shall be flushed with chemically treated water.

A. Procedure: Entire procedure shall be supervised by an independent chemical cleaning company.

B. Cleaning:

1. Flush out system for a period of not less than four (4) hours to clear it of all loose material.
2. Provide necessary cross-connection to loop the system and circulate water for 14 hours. During this period, install 80 mesh screens in strainers and periodically clean.
3. Drain entire system and refill system.
4. Meter water when refilling to determine amount of chemical required in next procedure.

5. Add TSP (trisodium phosphate) to a uniform residual concentration of 10,000 ppm.
6. Circulate water for 48 hours. During circulation, periodically clean screen as required.

C. Flush system for approximately four (4) hours or until all traces of chemicals are removed. Remove 80 mesh screens.

D. Chemical Treatment: For heating hot water systems add nitrate corrosion inhibitor, Aqua Serve B-239 or equal, 10 gallons inhibitor per 1,000 gallons of system water. Water treatment company shall include a water analysis of condenser and heating water systems in their monthly report and recommendation.

END OF SECTION

SECTION 15700

WET HEAT TRANSFER

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide wet heat transfer, complete.

A. Work Specified Elsewhere:

1. Air and Water Test and Balance: Section 15042.
2. Identification: Section 15047.
3. Vibration Isolation and Seismic Restraints: Section 15160
4. Mechanical Insulation: Section 15180.
5. Domestic Water Systems: Section 15402.
6. Water Treatment: Section 15650.
7. Air Moving Equipment: Section 15800.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following

1. Pumps.
2. Coils.
3. Expansion tanks.
4. Manual air vent valves.
5. Make-up water assemblies.
6. Variable Speed Drives

B. Shop Drawings: Installation details.

PART 2 - PRODUCTS

2.01 PIPE, VALVES, AND FITTINGS: Refer to Section 15050,

2.02 PUMPS:

A. General:

1. Centrifugal, single-stage horizontal end or double suction suitable for 150 psi working pressure.
2. Motor coupling: Flexible with guard, spacer type.
3. Impeller: Bronze, enclosing non-overloading.
4. Shaft: Steel.
5. Trim: Bronze.
6. Bearing rings: Renewable bronze.
7. Shaft sleeves: Renewable bronze (stainless steel on double suction).
8. Mechanical Seal: Carbon.
9. Bearings: Ball, grease lubricated, suitable for in-service lubrication.
10. Tested and guaranteed to withstand 1-1/2 times specified working pressure.

B. Pump and Motor Capacities:

1. Minimum as noted.
2. Suitable for parallel operation.

3. Motor to operate over entire head capacity range of pump without exceeding horsepower rating.
4. Pump characteristics:
   a. Pump curve shall rise continuously from maximum capacity to shutoff.
   b. Operation at or near peak efficiency.
   c. Capable of operation at 25% beyond the design capacity without exceeding breakoff point.
   d. Pumps in parallel shall operate 40% beyond design capacity.
   e. Impeller diameter; maximum 90% difference between maximum and minimum of published impeller diameters.

C. Alignment:

1. By pump manufacturer, at start-up with dial indicator to plus or minus 0.002".
2. Certify in writing that alignment work has been performed by manufacturer's personnel and that pumps are operating in accordance with design requirements

D. Pumps: Manufactured by Paco or Bell and Gossett

2.03 EXPANSION TANKS:

A. Construction:

1. ASME Code for Unfired Pressure Vessels, 150 psi.
2. Size, capacity and arrangement: As shown on the drawings.
3. Welded steel, galvanized after fabrication.
4. Connection tappings.
5. Pressure gauge.
6. Installed with anchor bolts to withstand 0.2g force. Submit details per Section 15160 - Vibration Isolation and Seismic Restraints.

2.04 COILS:

A. General: Coils shall be water type, continuous tube, single circulating for cooling and heating, ARI tested and certified.

B. Manufacturer: Coils shall be Trane, York, or approved equal.

C. Coil Construction: Shall be as follows:

1. Coils: 2-1/2" or 5/8" copper tube with aluminum fins mechanically bonded to tubes. Fin spacing shall not exceed 14 fins per inch.
2. Headers: Copper piping with braced tubing connections with inlet and outlet headers on the same end.
3. Venting and Draining: Pet cocks shall be provided for manual venting and draining.
4. Casing shall be 16 gauge minimum galvanized steel of channel construction with flanges punched for mounting.
5. Tube lengths over 45" shall have die formed intermediate supports.
6. Headers shall be encased and insulated.

D. Arrangement: Coils shall be designed for water and air counter flow and shall be circuited as required to provide even number of passes.

E. Pressure Test: Coils shall be underwater tested at the factory with air to pressure 50% in excess of the expected operating pressure.

2.05 DRIP PANS: Drip pans shall be provided, single insulated skinned or uninsulated single skinned types.

A. Construction:

1. Drip pans shall be fabricated of 16 gauge galvanized steel with corners and drains connections.
2. Sides and ends shall turn up a minimum of 2" inside and shall have rolled or curbed over edges.
3. Bottom pan shall be single skinned with 1/2" polyurethane insulated.
4. Intermediate pans shall be single skinned without insulation.
5. Interior of pans shall be coated with an asphaltic compound.

B. Drains: Shall be 1-1/2" IPS. Bottom pan drain shall be trapped with a wet seal.

2.06 WATER MAKE-UP PRESSURE REDUCING VALVE AND RELIEF VALVE: Provide pressure reducing valve in make-up line to system. Relief valves shall be piped to open waste. Cash Acme Type A-1, Bell & Gossett, Watts, or Bailey. Regulating and relief valve settings shall be as indicated.

2.07 VARIABLE SPEED DRIVES:

A. General: This Article covers the AC in variable speed drives (adjustable frequency). Drive shall be completely housed in a NEMA 1, floor-mounted enclosure complete with, but not limited to, the following items completely mounted, wired, and tested at factory before shipment.

1. Incoming circuit breaker, thermal and magnetic trip.
2. Incoming main starting contactor full rated for motor HP.
3. Over current relay for motor protection.
4. Full bypass network with switch and additional contactors to enable the user to manually switch the motor from the speed control of the inverter to across the line operation.
5. Control power transformer, 115 VAC rated at 150 VA.
6. Transducer 2-15 pi input, 4.20 MA output.
7. Manual / auto speed control with selector switch mounted on enclosure door.
8. Entire assembly shall be UL approved.

B. Drive Power Requirement: Shall accept 460 VAC, 3-phase input power with voltage variation of ± 10% and frequency ± 2 Hertz. Operation on 400 VAC, 50 or 60 Hertz shall be a standard drive feature. the drive shall be suitable for operation on NEMA design B motors of the same manufacturer. Motors and inverter drives of different manufacturers will not be acceptable. The drive shall have integral line reactors on the front end to minimize the generation of electrical noise back into the line and to provide near unity Power Factor, in accordance to IEEE 519 standard. SCR type inverter drives require isolation transformers to minimize the generation of electrical line noise.

C. Drive Horsepower Rating: As scheduled on the Drawings with a speed range of 3 to 60 Hertz for variable torque applications.

D. Variable Torque Application - Isolated Locations: In event of a sustained power loss, the control shall shut down safely without component failure. Upon return to power, system shall automatically return to normal operations. In event of a momentary power loss, the control shall shut down safely without component failure. Upon return of power, system shall automatically return to normal operations being able to restart into a rotating motor regaining positive speed control without shut-down or component failure.

E. Housing: The drive shall be housed in a NEMA 1 floor-mounted enclosure.

F. Operation: The drive shall be capable of operation under any combination of the following conditions without mechanical or electrical damage:

1. Ambient Temperature: 14 to 122°F.
2. Relative Humidity: 0 to 90% Non-condensing.
3. Vibration: 0 to 0.5 G.
4. Altitude: 0 to 3300 feet.

G. Control Specification:

1. Control System - Voltage Source, Sinusoidal PVVM Wave Form.
2. Output Voltage - 3-phase 400-460 volt.
3. Frequency Accuracy - +0.5% of highest frequency (at 250°C ± 101°C) 3 Hz to 90 Hz internally adjustable to 390 Hz on specified models.
4. Volts per Hertz Ratio - 3 to 50 Hz, V/HZ Constant 60 Hz and up; Voltage Constant.
5. Overload Capacity - 150% for 60 seconds; current limit circuitry shall phases back voltage and frequency until current decreases.

H. System: Variable speed drive system shall include diode bridge converter, filter network and a transistorized inverter section. Base driver signals used to control firing of power transistors shall be designed with Optically-Coupled isolators for optimum drive protection. Output must be a sinusoidal wave, pulse width modulated, voltage waveform for reduced harmonic heating in the motor. The system shall include all necessary control circuits, synchronizing equipment, and protective devices as required by design. Drive unit shall be able to withstand a phase-to-phase and a phase-to-ground short without damage to drive unit. The system protection, as a minimum, shall provide the following:

1. Current limit.
2. Overcurrent 0-250% IET (trips fault).
3. Short circuit - phase to phase (trips fault).
4. Over voltage - high DC bus voltage (trips fault).
5. Under voltage - 20% below line voltage cause (trips fault).
6. Momentary power failure - 1-milliseconds.
7. Burn-out - DC bus fuse protection or 3-phase input fusing.
8. LED indication:
   a. Over voltage.
   b. Under voltage.
   c. Overcurrent.
   d. Capacitor charge.

I. Input Equipment: The inverter drive shall be supplied with:

1. Incoming circuit breaker.
2. Incoming main starting contactor with suppresser.
3. 3-phase fuse protection.
4. Overcurrent relay for motor protection.

J. Operational Function:

1. Acceleration and deceleration time - 1 to 20 seconds acceleration; 3 to 30 seconds deceleration (by jumper).
2. Dynamic breaking 12% standard.
3. Signal follower 4-20 mA standard feature.
4. Adjustable current limit.
5. Ramp to stop feature (fault causes stop).
6. Unit shall have a microprocessor which will monitor input and fault information as well as select the optimum number of pulses per waveform.
7. Drive unit shall be able to disconnect from the load for set up or troubleshooting.

K. Enclosure: Drive shall be mounted in a MEMA 1 floor mounted enclosure.

1. Circuit breaker.
2. Main starting contactor with coil suppressed.
3. 3-phase fuse protection.
4. Overcurrent relay for motor protection.

L. Service: The manufacturer shall maintain field service which shall allow a quick response by a service engineer.

M. Documentation: The manufacturer shall supply one instructional operating and maintenance manual per unit with the equipment. Copies of factory test of the finished unit shall be available on request.

N. Experience: Manufacturer shall specify number of years of its on-line experience with variable speed drives.

O. Maintenance Insurance: The manufacturer shall supply a recommended list of spare parts.

P. Door Mounted Operator's Devices:

1. Start/stop illuminated pushbutton.
2. Fault reset pushbutton.
3. Frequency meter.
4. Single turn speed pot.

Q. Variable Speed Drive Factory Test: Upon completion of manufacture and assembly, drives shall be subjected to a complete factory test to demonstrate compliance with specified features and characteristics. The Owner at its option shall be able to witness factory testing of its unit, with coordination with the factory.

R. Testing Procedure: Shall be the manufacturer's standard procedure to assure maintenance free service. The Owner shall be given a 5-day notice prior to the start of factory testing for the Owner's representative to witness the testing.

S. Procedures: All equipment, devices, instrumentation, and personnel required to perform the test shall be supplied by the manufacturer. Upon satisfactory completion of the test, the manufacturer shall submit two certified copies of the test report to the Architect. Component failure during the testing shall require repeating any test associated with failure or modified components to demonstrate proper operation.

T. Performance:

1. Vendor shall supply minimum guaranteed efficiencies at 10%, 50%, and 100% speed for 25%, 50%, 75% and 100% torque.
2. Vendor shall supply both motor and control (in combination and separately) efficiencies.
3. Vendor shall supply control efficiencies only. The control shall be tested with a motor (supplied by vendor) of appropriate size.

U. Acceptable Manufacturers: Toshiba or Reliance.

PART 3 - EXECUTION

3.01 EXPANSION TANK: Provide make-up water connections from valved outlet provided under Section 15402. Pipe relief valve to spill over floor drain.

3.02 DRAIN VALVES:

A. Provide 12" long dirt legs and drain valves at each system low and at the bottom of each riser and equip with 3/4" hose end gate valve.
B. Provide manual air vent at each high point in system. Vent shall be piped to floor drain 1/2" size. Air chamber at high point shall be one pipe size larger than main or branch pipe size and 12" long.

3.03 PUMPS: Pumps shall be installed as specified in Section 15160 - Vibration Isolation and Seismic Restraints.

A. Piping connections to pumps shall include not less than three (3) grooved pipe couplers flex connections of appropriate pressure rating to provide relief of all stresses on pump casings.
B. Shut-off valves and non-slam check valves shall be provided.
C. Inlet to pump shall include a strainer (where shown) and not less than four (4) pipe diameters of straight pipe.
D. Make connections to chemical pot feeders across common headered pump suction and discharge.

3.04 COILS: Coils shall be installed in banks as indicated to provide the required face area. Structural bracing shall be provided to comply with Section 15160 - Vibration Isolation and Seismic Restraints.

A. Coil banks shall be piped to provide reverse return and equal water friction in each circuit without balancing valves. Coils shall have drain valves and manual air vents as required.
B. Coil drain pans shall be piped to drains as shown, with traps to preclude free flow of air through drain.

3.05 PIPING: See Section 15050 - Basic Mechanical Materials and Methods.

END OF SECTION

SECTION 15800

AIR MOVING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide air moving equipment, complete

A. Related Work:

1. Vibration Isolation and Seismic Restraints: Section 15160.
2. Ductwork: Section 15840.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Published fan performance curves.
2. Published sound power levels based on actual test data.
3. Finishes.
4. Complete descriptive and capacity data.

B. Shop Drawings: Installation details.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL:

A. Standards: All fans shall be tested and rated in accordance with the standard test code of the AMCA. Centrifugal and propeller type fans shall bear the AMCA certified rating seal.

B. Factory Finish: All fans shall have factory prime coat and factory enamel coat finish unless otherwise shown or specified. Any finish damaged in shipment or in installation shall be repaired to equal factory finish.

C. Size and Capacity: Shall be as scheduled.

2.02 VANEAXIAL FANS:

A. Description: Vaneaxial fans consisting of fan wheel and housing, straightening vane section, factory-mounted motor, an inlet cone section, and accessories. Variable features indicated in the equipment schedule include belt driven or direct drive as indicated, and variable or adjustable pitch.

1. Variable-Pitch Fans: Internally mounted pneumatic actuator, with externally mounted positive positioner, and mechanical-blade-pitch indicator for variable-volume operation.

B. Housings: Steel with inlet bell and diffuser sections.

1. Inlet and Outlet Connections: Outer mounting frame and companion flanges; inlet cone shall be welded to the fan raceway.

2. Guide Vane Section: Integral guide vanes downstream from the fan wheel, designed to straighten the airflow.

C. Wheels: Cast-aluminum, axial-flow type, with airfoil-shaped blades mounted on cast-iron wheel plate keyed to shaft with solid steel key.

D. Fan Hub and Blade-Bearing Assemblies: Cast aluminum, machined and fitted with threaded bearing wells to receive blade-bearing assemblies.

1. Blades: Replaceable, cast aluminum; factory mounted and balanced to the hub assembly.
2. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of the first critical speed at the top of the fan's speed range.

E. Shaft Bearings: Radial, self-aligning ball or roller bearings.

1. Ball-Bearing Rated Life: AFBMA 9, L-10 of 100,000 hours.
2. Roller-Bearing Rated Life: AFBMA 11, L-10 of 100,000 hours.

F. Direct-Drive Units: Motor encased in housing, out of air stream, factory wired to disconnect located on outside of fan housing.

G. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor: 1.4.
2. Pulleys: Cast iron with split, tapered bushing, dynamically balanced at factory.
3. Motor Pulleys: Adjustable pitch for use with motors through 5 HP; fixed pitch for use with motors larger than 5 HP. Select pulley so pitch adjustment is at the middle of the adjustment range at fan design conditions.
4. Belts: Oil resistant, non-sparking, and non-static; matched sets for multiple belt drives.
5. Belt Guards: Fabricate of steel for motors mounted on the outside of the fan cabinet.
6. Motor Mount: Adjustable base.

H. Accessories: The following accessories are required:

1. Companion Flanges: Rolled-steel flanges.
2. Inlet and Outlet Screens: Wire mesh screen on fans not connected to ductwork.
3. Backdraft Dampers: Butterfly style, for mounting with flexible connection to the discharge of the fan or direct mounted to the discharge diffuser section.
4. Stall Alarm Probe: Sensing probe capable of detecting fan operation in stall and signaling control devices. Control devices and sequence of operation are specified in other Division 15 Sections.
5. Flow Measurement Port: Pressure measurement taps installed in the inlet of the fan to detect and signal airflow readings to temperature-control systems. Control devices and sequence of operation are specified in other Division 15 Sections.
6. Inlet Vanes: Adjustable; having peripheral control linkage operated from outside of the air stream, bronze sleeve bearings on each end of vane support, and provision for manual or automatic operation as indicated.

2.03 CENTRIFUGAL FANS:

A. Manufacturers: Barry, Buffalo, Chicago Blower, New York Blower, Greenheck, Twin City, or Cook.
B. General: Unless otherwise indicated, furnish fans with drive arrangement 9, 10, or 1, with a baked on phenolic coating, AMCA Class C spark resistant construction and TEFC motors.
C. Housings: Heavy gauge steel, continuously welded throughout and braced and supported by structural channels or angle irons to prevent vibration or pulsation, flanged outlet, fully streamlined inlet.
D. Wheels: Backwardly inclined (BI) blades welded to spun wheel cones.
E. Bearings: Heavy duty, grease lubricated, ball or roller, self-aligning, pillow block type housing; selected for minimum life of 80,000 hrs (AFBMA L-10) at maximum cataloged operating speed. Furnish bearings with pressure relief type external grease fittings.
F. V-belt Drives: 200% of motor nameplate horsepower.
G. Mounting Rails: Furnish common mounting rails for fan and motor as appropriate for fan arrangement indicated.
H. Inlet Screens: 1" mesh 304 stainless steel for fans without inlet ductwork.
I. Access Doors: Bolted and gasketed type in fan housing for inspection of interiors and wheel.
J. Drain Connection: 3/4" NPT external threads located at the lowest point of fan housing.
K. Painting: Unless special coating is specified, all metal parts shall be painted with prime coat after metal cleaning and surface preparation. In addition, apply second coat of paint to all exterior surfaces.

2.04 DUCT FANS:

A. Type: Direct drive, forward curved centrifugal blower type acoustically insulated for quiet operation.

B. Construction: The outer box and housing shall be constructed of galvanized steel. The housing motors and blowers shall be completely removable by means of removable fasteners. The motor shall be permanently lubricated. The unit shall be supplied with an internal wiring box and receptacle.

1. Discharge position shall be changeable by relocating plates on side and bottom.
2. The fan shall be certified and licensed to bear the AMCA seal for air and sound; all UL and CSA listed.

C. Acceptable Manufacturers: Loren Cook, Greenheck.

2.05 CENTRIFUGAL ROOF EXHAUSTERS:

A, Type: Centrifugal-adjustable 'V' belt drive.

B. Capacity: As scheduled.

C. Construction: Ventilator housings shall be of aluminum. Louver blades shall be minimum of 0.081" aluminum and extruded of 6063T alloy. Blades shall incorporate an integral storm-proofing lip. All corners shall be open, mitered, and welded on the blade underside. Louver blades shall be arranged vertically in an extended stacking design beyond the shoulder of the roof curb. Design of fan shall permit 'airstream' cooling for fan motor. Structural steel supports shall be 'acrylized' for protection. Fan wheels shall be non-overloading and of "Taper Hush" quiet operation, and have hinging arrangement for accessibility to interior parts. Each fan shall be equipped with aluminum expanded metal bird guards, disconnect devices, adjustable drive, and backdraft dampers.

D. Acceptable Manufacturers: Loren Cook, Greenheck.

E. Sound Power Level: Exhaust fan sound power level shall not exceed the scheduled values specified in Part 3, Table1.

2.06 CENTRIFUGAL FILTERED ROOF BLOWER:

A. Type: Roof-mounted, filtered supply blower shall of the belt-driven, double width, double inlet (DWDI) centrifugal blower type.

B. Capacity: As scheduled.

C. Construction: Hoods shall be louvered penthouses constructed of heavy gauge extruded aluminum with continuously welded and mitered corners, and shall have removable aluminum top caps. Curb cap shall be constructed of aluminum. Support structure and blower assembly shall be constructed of steel.

1. Blower wheels shall be non-overloading backwardly inclined airfoil type, and carefully trued after assembly and dynamically balanced to insure vibration free operation.
2. The blower shafts shall be AISI C-1040 or C-1045 hot rolled and accurately turned and polished, close tolerances shall be maintained where shaft makes contact with the bearings.
3. All bearings shall be grease lubricated, precision anti-friction ball self aligning pillow block type.
4. All drives shall be designed for 165% of rated horsepower capabilities and motor drives shall be variable pitch thru 5 horsepower. Oil resistant non-static belts shall be provided.
5. All units shall be equipped with removable filters as scheduled. The frame shall be of aluminum material, thus insuring long life.

D. Acceptable Manufacturers: Loren Cook, Greenheck.

PART 3 - EXECUTION

3.01 FAN INSTALLATION: Mount base fans shall be mounted on vibration isolation bases on housekeeping pads. Hanging fans shall be hung with vibration isolation hangers.

A. Installation: Fans shall be set in place, leveled and vibration isolation elements adjusted for proper clearance prior to fitting and attaching flexible connections. Bases and vibration isolation elements shall be securely bolted in place and blocked until system is ready for testing.

3.02 VIBRATION ISOLATION: Vibration isolation shall be as scheduled. See Section 15160.

3.03 COMMISSIONING:

A. Manufacturer's Field Inspection: Engage factory-authorized service representative to perform the following:

1. Inspect field assembly of components and installation of central-station air-handling units including piping, ductwork, and electrical connections.
2. Prepare a written report on findings and recommended corrective actions.

B. Final Checks Before Startup: Perform the following before startup:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections for the piping, ductwork, and electrical are complete. Verify that proper thermal overload protection is installed in motors, starters, and disconnects.
3. Perform cleaning and adjusting specified in this Section.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify free fan wheel rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
6. Install clean filters.
7. Verify manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in fully open position.

END OF SECTION

SECTION 15840

DUCTWORK

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide ductwork, complete.

A. Related Work:

1. Air and Water Test and Balance: Section 15042.
2. Vibration Isolation and Seismic Restraints: Section 15160.
3. Mechanical Insulation: Section 15180.
4. Duct and Plenum Lining: Section 15848.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include 6 copies of Product and Equipment Data for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Grilles, registers and diffusers,
2. Dampers.
3. Air filters.
4. Flexible ducts.
5. Ductwork accessories.
6. Duct sealing.

B. Shop Drawings: Ductwork typical construction and coordinated layout drawings.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Galvanized Steel Sheets: First quality cold rolled, galvanized, open hearth soft steel sheets, capable of double seaming without fraction, meeting ASTM A526-64T.

B. Aluminum Sheets: Shall meet requirements of ASTM B209, mil finish.

C. Stainless Steel Sheets: Shall be Type 304 or 316 as the case may be.

2.02 CIRCULAR DUCTS AND FITTINGS: Galvanized steel of spiral construction as manufactured by United Sheet Metal, Peabody & Wind, or Spiromatic. Corrugated or flexible metal duct will not be acceptable.

2.03 ACCESS DOORS: For circular ducts shall be United Sheet Metal Type AR-W, Peabody & Wind, Spiromatic.

2.04 MATERIALS:

A. Medium pressure ductwork shall be galvanized steel.
B. Low pressure ductwork shall be galvanized steel.
C. All bracing, angles, bars, and straps shall be steel.
D. Screws and bolts shall be cadmium plated.

2.05 INSULATED FLEXIBLE DUCTWORK: Insulated flexible ductwork shall be factory pre-insulated, spiral helix spring permanently bonded to an exterior liner, and sheathed in an exterior vapor barrier jacket.

A. Manufacturer: Flexible ductwork shall be Glass-Flex or ABL 181, as appropriate for service.

B. UL Requirements: Entire flexible duct assembly shall be labeled in accordance with UL 181 Class 1 air duct requirements and not have a flame and smoke spread rating in excess of 25/50.

C. Installation: Conform to factory supplied and UL approved printed installation instruction sheets.

D. Submittals shall be required to include Product Data sheets and installation instruction sheets in order to assure awareness of the proper installation technique.

E. Thermal Conductance: Insulation must achieve a minimal thermal conductance of 0.19 for ABL-181 and must be completely shielded from the airstream at all times.

2.06 CONTROL DAMPERS:

A. Volume Control Dampers:

1. Single Blade Butterfly Dampers: Damper shall be one gauge, over duct gauge, galvanized steel with 3/8" square rod and secured in place with a self-locking regulator. Regulator shall be Ventlock No. 641, or equal by Duro Dyne.

2. Opposed Blade Dampers: Frame shall be 12 gauge, minimum, steel channel, 2" wide with 1/2" web welded throughout. Blades shall be steel reinforced with triple 1" diameter beading secured to square or rectangular shafts which turn in teflon or bronze bearings. Seals shall be neoprene supplied to the sealing edge and ends of the blade sealing blade to frame. Finish shall be black enamel.

3. Backdraft Dampers: Extruded aluminum construction with vinyl blade edge seals and blade ends overlapping frame.

2.07 FIRE AND SMOKE DAMPERS: Shall be designed and constructed in accordance with NFPA Standard 90A and UL Standard 555, and shall be so labeled with a permanent identification.

A. Fire Dampers:

1. Dampers shall be rated for rating of separation walls.
2. Damper frames shall be permanently attached to code mounting sleeve.
3. Damper blades in medium and high velocity ducts shall be out of airstream, interlocking shutter type.
4. Fusible link shall be rated for 1600°F.
5. Complete assembly shall be galvanized.
6. Manufacturer: Square or rectangular type shall be Air Balance, Inc. Fire/Seal, or equal, by Ruskin or Airstream Products. Round duct type shall be Air Balance, Inc., Fire/Seal, or equal, by Ruskin or Airstream Products

B. Smoke Dampers:

1. Dampers shall be motor operated.
2. Damper frames shall be permanently attached to a 16 gauge minimum mounting sleeve.
3. Damper blades shall be multi-blade type of 16 gauge minimum steel.
4. Complete assembly shall be galvanized.
5. Motor operator shall be 24 volt UL listed package type with motor enclosed in 22 gauge minimum housing.
6. Damper shall be provided with end switch for connection to life safety system by others.
7. Square or rectangular duct type shall be Ruskin SD-35, SD-60 as appropriate for point of use, or same type and quality by Air Balance or Airstream Products.

2.08 AIR DISTRIBUTION EQUIPMENT: Refer to additional requirements specified in Section 01600.

A. General:

1. Equipment shall provide required air flow, throw and spread without excessive drafts or noise in the ventilated or air conditioned areas.
2. Provide all accessories required to effect these conditions.
3. Grilles, registers, extractor, dampers or diffusers causing excessive drafts or noise shall be replaced at no additional cost to the Owner.
4. Performance rating shall be certified by the ADC.
5. Noise level ratings shall be in accordance with ADC Test Code No. 1062 GRD84 ASHRAE Std. 70-72. NC value shall not exceed 30 NC based on room absorption of 10 dB re 10^{-12} watts.
6. Test room and test instruments shall be ADC approved.
7. Air distribution equipment shall be of specified types as manufactured by Air Distribution Products, Titus, or Krueger.

B. Types:

1. Ceiling Diffuser: Ceiling diffuser shall be square or rectangular, directional blow type with removable multiple cores, concealed spline ceiling type with hinged perforated face plate with 3/16" holes on 1/4" centers (51% free area). Diffuser shall be ADP-MAC-PERF. Finish shall be flat black enamel on back pan and core and off-white baked enamel on perforated plate and margin.

2. Return Air Grilles Perforated:

a. Type: Concealed spline mounting, frame style designed to be integrated with ceiling construction. They shall be provided with key operated opposed blade dampers where indicated on the Drawings. The perforated face shall match the supply diffusers with black interior core.

b. Capacity and Size: As shown.

c. Construction:

(1) Plaster or Drywall Ceiling: Frame and perforated plate shall be fabricated of steel or extruded aluminum. They shall have a hinged perforated face plate which can be removed.

(2) Concealed Spline Ceilings: The perforated face shall be supported by the ceiling on four sides without a frame. Interior of register shall be painted black.

d. Acceptable Manufacturer: Air Distribution Products, Model PRG-5.

3. Sidewall Diffuser: Steel with double deflection adjustable pattern, vertical face bars, horizontal rear bars, with opposed blade volume control damper, Titus Model 272RL5. Finish shall be off-white baked enamel.

4. Sidewall Return: Steel with 1" overlap margin, horizontal fins with opposed blade damper, Titus, Model 23R, or approved equal. Finish shall be off-white baked enamel.

5. Type TG Transfer Grille: Steel with 1-1/4" overlap margin, horizontal fins, Titus, Model 23R. Finish shall be off-white baked enamel.

6. Exhaust Registers: Cube core type 1/2" x 1/2" x 1/2", 90% free area and complete with opposed blade damper.

7. Ceiling Diffuser, Linear Slot Type: 1800 adjustable pattern stripline slot with pattern controller and damper.

a. Capacity and Size: As shown.

b. Construction: Diffuser shall have extruded aluminum face, metered corners, with supporting brackets arranged for grid suspension. It shall have an inner vane, adjustable through 180" for control of air pattern and separate volume regulator. Finish shall be anodized aluminum, color selected by Architect

c. Acceptable Manufacturers: Titus Modulinear ML 3700, Type 2 frame (to be verified with Architect) 1/2" slot, or approved equal.

8. Floor Grille and Sidewall Linear Slot Type: Linear slot with margin and pattern controller.

a. Capacity and Size: As shown.

b. Construction: Diffuser shall have extruded aluminum face, mitered corners, with supporting brackets arranged for grid suspension. It shall have an inner vane, adjustable through 180° for control of air pattern. Finish shall be anodized aluminum, color as selected by Architect.

c. Acceptable Manufacturer: Titus Fineline, CT-1 5 and 16 with Type 2 and 15 frames (to be verified with Architect) without volume damper, 1/4" slot.

2.09 AIR FILTERS: Filters shall be furnished complete with media, retainer frames, and housing certified to meet design requirements. Filters shall be types as specified, by Farr Co.

A. Replaceable Filters: Filter shall be replaceable type 24" x 24" complete with frame and retainer, 4" or 2" thick as scheduled. Filter shall be complete with holding frame. Average efficiency shall be a minimum of 30% based on rating in accord with ASHRAE Test Standard 52-76. Initial resistance at rated capacity 0.35" w.g.

B. High Efficiency Filter: Filter shall be replaceable 24 x 24 complete with frame and retainer, 12" thick as scheduled. Filter shall be complete with holding frame with provisions for 4" prefilter. Average efficiency shall be minimum 80-85% based on rating in accordance with ASHRAE 52-76 test standard. Initial resistance at rated capacity 0.50" w.g.

2.10 VARIABLE AIR VOLUME ZONE TERMINALS: Provide electronically controlled, digitally addressable, pressure independent variable air volume control terminals. Furnish sizes and capacities as scheduled or shown on the Drawings.

A. Terminals shall be factory furnished with digital electronic velocity/temperature control systems, electric damper actuators and electronic room temperature sensors all factory assembled and calibrated.
B. Zone terminal and all accessories, except for the room temperature sensor, shall be factory assembled in a single cabinet. Field assembly of loose components shipped to the jobsite, other than those specified to be loose, is not allowed.
C. Cabinets shall be constructed of not lighter than 24 gage, galvanized steel.
D. Internal surfaces of the casings shall be acoustically and thermally insulated with one inch (1") glass fiber material surface treated to prevent corrosion and meeting UL-1 81 and NFPA 90A requirements. Any cut edges for fiberglass exposed to moving air stream shall be coated with NFPA 90 approved sealant.
E. The air volume damper assembly shall be located inside the unit casing and shall be constructed from exactly dimensioned components. Damper blades shall have edge and end seals. All internal damper pivot points shall be nylon fitted for noiseless operation and require no lubrication. Air volume dampers shall be constructed to prevent air leakage in excess of 1 % of maximum rated air quantity with 3" inlet static pressure when closed tight, as rated by Air Diffusion Council test code 1062R4.
F. Air volume damper shall be directly connected to an electric damper actuator which shall drive damper from wide open to tightly closed. Mechanical stops on damper or actuator to establish the minimum air flow are not allowed.
G. Provide electronic direct digital pressure independent control of terminal including heated type velocity sensor, thermistor type room temperature sensor, double acting electric damper actuator and digitally addressable control unit. Control system shall be capable of holding the air volume constant ± 5% from terminal design minimum to terminal design maximum set points with up to 4" static pressure at high side of damper. Control system including room temperature sensor shall use no more than 24 VA and 24 VAC control power, including all accessories furnished.
H. Room temperature sensor shall be thermistor type. Controller manufacturer shall provide sensor with blank over, with satin aluminum finish and no nameplate, a multipurpose wall mounting kit and 50 feet of F.M. terminal for mounting and connection in the field.
I. Terminal units shall be sized such that at nominal terminal design flow, the pressure drop through the assembly shall be no more than 0.3" water column.
    1. Each unit shall be shipped with appropriate identification including model, size, maximum and minimum rated air flow within limits of the control system and velocity vs CFM chart for validating performance.
    2. Furnish 120/24 VAC control power transformers.
    3. Acceptable Manufacturers: Carrier, Trane, Titus, Environtech, or approved equal.
    4. Maximum radiated sound power levels shall not exceed that which will result in an on-site noise level of NC-37 maximum in occupied space below with 1.25" w.g. inlet pressure and the specified design air volume scheduled at 0.25" w.g. discharge pressure. Units shall meet acoustic ratings as specified in Part 3, Table 2.
    5. Unit casings shall have round or oval duct collars on primary inlet connection and rectangular on the supply air outlet connection. Casing shall contain mounting connection for hanging by sheet metal straps from a concrete slab. Unit casings shall not leak in excess of 2% of scheduled design air flow at 3.0".
    6. Provide factory discharge attenuators.
    7. Inlet ducts from mains shall be at 0.3" per 1 00 feet or 2,000 FPM, whichever provides the larger duct.

2.11 SOUND TRAPS: Factory assembled unit tested and certified by independent acoustic testing laboratory, Industrial Acoustics Company or Rink Corporation.

A. Construction: Casing shall not be lighter than 22 gage galvanized steel in accord with specified construction of medium pressure ductwork. Seams shall be locked form and mastic filled. Acoustical fill shall be inorganic long fiberglass packed under not less than 5% compression, and shall have a flame spread classification of 25, smoke development rating 0, and fuel contribution 20.

B. Acoustical Performance: Sound traps shall be tested by independent testing laboratory ad shall certify that units meet the scheduled acoustic ratings as specified in Part 3, Table 1.

C. Certification: The sound traps shall meet all applicable codes for use and shall be so certified.

D. Type: For supply, use IAC 7LFL. For return, use IAC 5LFL.

PART 3 - EXECUTION

3.01 SHEET METAL DUCTWORK: Install ductwork of sizes, runs, and connections as indicated. Verify all dimensions at the site, making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Make allowances for beams, pipe, or other obstructions in building construction and for Work of other trades. Check Drawings showing work of their trades and notify the Architect in the event of any potential interference.

A. Fabrication: Fabricate ductwork in workmanlike manner with airtight joints, presenting smooth surfaces on inside, neatly finished on outside, construct with curves, bends, turning vanes to aid in easy flow of air. Make internal ends of slip joints in direction of air flow. All ducts, duct fittings and materials shall conform to SMACNA recommended practice as specified in the SMACNA Duct Construction Standards latest edition and California Mechanical Code 2001 requirements.

B. Supports: Support and brace ducts and air plenums to prevent sagging and to minimize vibration when fans are operating. Provide seismic bracing per Section 15160.

C. Sizes: Dimensions of acoustical lined ductwork are clear inside dimensions. Increase size of duct by thickness of acoustic lining.

D. Cleaning: Blow out all dirt and foreign matter from ductwork, and clean diffusers, registers, and grilles, prior to operating system.

E. Low Pressure Rectangular Galvanized Steel Ductwork: Construct with wall thickness and gages as scheduled by SMACNA Duct Construction Standards latest edition.

F. Bracing: Provide for all rectangular ductwork, be attached to duct with rivets, bolts, or spot welded, and spaced to comply with latest SMACNA Guidelines for Seismic Restraints of Mechanical Systems and California Mechanical Code 2001.

G. Circular Galvanized Steel Ductwork: Wall thickness and gauges for circular ducts shall be as scheduled by SMACNA Duct Construction Standards latest edition and California Mechanical Code 2001.

H. Fittings and Connections for Circular Ducts: Fittings shall be factory fabricated with radii of elbows and angles minimum of 1-1/2 times diameter or maximum width of duct. Tee fittings shall be of conical type change in shape from round to rectangular mode with transformation joint with minimum of 1 to 7 taper. Joints between two ducts shall be made with beaded sleeve joint as scheduled with duct sealer applied to make end, mechanically fastened with sheet metal screws or pop rivets. Apply coating of duct sealer over joint and screw or rivet heads.

I. Duct Supports: Support horizontal ducts with hangers of scheduled size and spacing. Install hangers at each change in direction of duct. Extend strap hangers down both sides of duct, turn under bottom 1" minimum. Metal screw hangers to bottom of duct and to upper and lower sides of ducts at not over 12" on center. Provide angle hangers formed by extended vertical bracing angles or by rods connecting to bottom angles if size or bracing angles conform to hanger schedule.

1. Support vertical ducts at every other floor with angles or channels riveted to ducts. Reset angles on channels on floor slab or structural steel members placing in opening, unless otherwise shown.
2. Hangers shall be constructed of galvanized steel.
3. Conform hangers for horizontal rectangular or circular duct to SMACNA Guidelines for Seismic Restraints for Mechanical Systems dated April 1976, and SMACNA Duct Manual and California Mechanical Code 2001.
4. Seismic restraints as specified in Section 15160 - Vibration Isolation and Seismic Restraints.

J. Taping Duct Joints: Make supply duct joints airtight by covering all duct joints, including angle iron connections, with 6" wide strips of six (6) ounce canvas cemented on with lagging adhesive. Joints shall be sealed and filled with mastic in punched holes and corner cracks. Alternate methods may be used when permitted.

K. Tapers: Pitch sides of duct in a "diverging" airflow of 1 to 4 taper. Pitch sides of duct in a "converging" airflow maximum of 1 to 4 taper.

L. Supply Elbows: Shall be designed for minimum friction with inside radius not less than width of duct. When required radius elbows cannot be obtained, use square elbows with hollow double radius type duct turns. Attach duct turns to duct securely with spot weld screws or rivets. Friction type attachment not acceptable. Special vaned elbows shall be as shown. Turning vanes are not acceptable in other than low velocity, low pressure ducts.

M. Flexible Duct Connection: Provide 16 ounce neoprene coated glass fabric at all connections to fans. Install with metal collar frames at each end of connections. Attach fabric tightly to ducts. Allow at least 1" slack in connections. Make fabric connections minimum 4" long.

N. Flashing Ducts Through Roof: Install flashing to cover top and sides of curb and fit closely around duct. Cover top edge of base flashing with collar soldered to duct and turned down over base flashing. Fabricate flashing from 24 gauge galvanized steel.

O. Test holes: Drill instrument test holes in ductwork for pilot tube tests. Install Ventlok No. 699 or 699-2 instrument test hole as required for insulation thickness.

P. Access Doors In Rectangular Ducts: Construct with galvanized steel metal of same gauge as duct, with frame, galvanized steel hinges, handles, clamping devices, gasketed for airtight fit. Fabricate double skinned with insulation core where ducts are insulated. Sizes are shown, minimum 12" x 12". Provide where required for access to dampers and other equipment requiring service or inspection, and for cleanouts.

Q. Duct Liner: Ducts and plenums shall be lined as specified in Section 15848 - Duct and Plenum Lining.

3.02 FLEXIBLE AIR DUCT:

A. Installation: Insulated flexible ducts shall be continuous, single pieces not over 7' in length for low pressure, and shall be adequately supported and shall not be installed with an inside radius of bend less than two duct diameters. Flexible ducts shall be installed in as straight a manner as possible. Cut ducts to lengths required rather than create bends to take up excess lengths.

B. Joining: Where flexible ducts join other ductwork and air terminals, duct sealer and sheet metal bands shall be used to secure flexible duct and make the joint airtight.

3.03 DIFFUSERS, REGISTERS AND GRILLES INSTALLATION: Coordinate with ceiling features:

A. Diffusers, plenum boxes, linear grilles, shall be fully coordinated to fit into the ceiling materials shown on the Architectural Drawings.

B. Drywall and plaster ceilings, diffuser, register, or grille trim shall overlap drywall or plaster line with overlapped margins.

C. Acoustic Tile Adhesively Applied to Drywall or Plaster Ceilings: Diffusers, registers, or grilles shall be furnished with overlapped margins.

D. Lay-in T-bar or Concealed Spline Systems: Square or rectangular diffuser and grille edge trim shall be flush with the finished ceilings. Unit frames shall be sized to fit t-bar module or 1/2 module.

3.04 JOINT SEALING:

A. Round Duct Joints: In diameters through 50" shall be assembled and sealed as follows:

1. Approved sealer is applied to the male end of the coupling and fittings. After the joint is slipped together, sheet metal screws are placed 1/2" from the joint bead for mechanical strength. Sealer is applied to the outside of the joint, extending 1" on each side of the joint bead and covering screw heads. Plastic backed tape is immediately applied over the wet sealer.
2. Duct sealer must be specifically formulated for the job of sealing the field joints for high pressure systems. The sealer shall be compatible with plastic-backed duct tape so the two cure and bond together. Samples of sealer and tape and specification data sheets shall be submitted for approval.
3. Flanged joints shall be sealed by neoprene rubber gaskets.
4. Supply ductwork (air conditioning, ventilation, fresh air): Shall have transverse and longitudinal seams sealed with Tuff-Bond No. 12 or United Duct Sealer.

B. Duct Penetration at Walls and Shafts: The annular space between the duct and building shall be packed with one pound density glass fiber. Seal the edges flush with the wall or shaft with Seal Right Corporation asbestos mastic. Ductwork exposed to view shall have escutcheon or collar covering wall opening.

TABLE 1 - TERMINAL AIR UNIT MAXIMUM SOUND POWER LEVEL
Octave Band Center Frequency

63	125	250	500	1000	2000	4000	8000
Maximum Casing Noise (PWL, dB re 10^{-12} watts)							
43	44	37	35	33	37	38	39
10' from less critical occupancy (NC-4- - NC-35)							
46	48	42	40	38	42	43	44
Maximum Radiated Noise (PWL, dB re 10^{-12} watts)							
83	71	58	52	54	53	51	51
Minimum Insertion Loss							
8	10	10	10	10	10		

Test at 3" inlet pressure.

END OF SECTION

SECTION 15848

DUCT AND PLENUM LINING

PART 1 - GENERAL

1.01 SUMMARY: Division 1, Section 15010, and Section 15050 apply to this Section. Provide duct and plenum lining, complete.

A. Related Work:

1. Air Moving Equipment: Section 15800.
2. Ductwork: Section 15840.

1.02 SUBMITTALS: Conform to Section 01330, Section 15010, and as specified in this Section.

A. Product and Equipment Data: Submittal shall include six (6) copies of Product and Equipment for all the products, materials, and equipment specified in this Section including, but not limited to, the following:

1. Lining materials: Properties and sound ratings.
2. Fasteners.
3. Adhesives.

1.03 CLASSIFICATION: Products shall conform to NFPA Section 90A, with special regard to the fire hazard classification requirements of NFPA No. 255, including vapor barriers and adhesives. All products shall possess a flame spread rating of not over 25, fuel contributed rated of not over 50, and a smoke developed rating of not over 50.

PART 2 - PRODUCTS

2.01 TYPE DL DUCT LINING: Lining shall be 1" thick, 1-1/2 pcf density semi-rigid fiber glass blanket coated on side with a fire resistant black neoprene coating resistant to surface fiber blow off. Lining shall have a "K" factor of 0.25 maximum at 75°F. mean temperature. Lining shall be Johns-Manville "Micro-Lite", or equal by Owens Corning Fiberglas, CertainTeed, or Pittsburgh Plate Glass.

2.02 TYPE DL LINING: Plenum liner shall be semi-rigid board insulation 2" thick, 3 pcf density glass fiber, with coating to prevent erosion and flaking of the lining, and to prevent harboring of germs. Liner shall have a maximum "K" factor of 0.26 at 75°F. mean temperature and fire hazard classification of 25-50-50. Liner shall be Owens Corning Fiberglas, CertainTeed, Johns-Manville, or Pittsburgh Plate Glass.

PART 3 - EXECUTION

3.01 APPLICATION OF DUCT LINING:

A. Type DL lining:

1. Installation shall follow the SMACNA "Duct Liner Application Standard" unless specific exceptions follow.
2. Duct liner shall be adhered to metal surface with 100% coverage of fire resistant adhesive.
3. On ducts over 20" in width or depth additionally secure the liner with mechanical fasteners, weld pins with clips, on 12" maximum centers. Fasteners shall be located within 2" of lining leading edge of each section and within 3" of all cross joints.
4. All exposed edges and the leading edge of all cross joints of the liner shall be heavily coated with fire resistant adhesive and provided with a metal nosing piece.
5. The liner shall be accurately cut to assure snug closing corners and tightly butting joints.
6. Coated surface shall face the air stream.
7. Repair breaks and abrasions with adhesive and mechanical fastening to assure a continuity of the surface.

3.02 APPLICATION OF PLENUM AND CASING LINING:

A. Type PL Lining: Installation shall follow the SMACNA "Duct Liner Application Standard" unless specific exceptions follow.

1. Adhere plenum liner to metal surface by 100% coverage of adhesive and mechanical fasteners, weld pins with clips, on 16" centers.
2. Mechanical fasteners shall be located within 2" of lining edges.
3. All exposed edges and all butt joints of lining shall be heavily coated with fire resistant adhesive.
4. The liner shall be accurately cut to assure snug closing corners and tightly butted joints.
5. Coated surface shall face the air stream.
6. Repair minor breaks and abrasions with adhesive and mechanical fasteners to assure a continuity of the surface. Major breaks or tears shall be cut out and replaced with new liner.
7. All built up plenums or casings at coils, fans or filters shall be lined, except where structural metal casings are used. See Section 15840 Ductwork.

END OF SECTION

SECTION 15900

BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1, Section 15010, and Section 15050 apply to this Section. Provide building automation and automatic temperature control systems, complete.

A. Work In This Section: Principal items include:

1. Central processing unit.
2. Software.
3. Control equipment.
4. Control air compressor.
5. Control valves.
6. Automatic dampers.
7. Damper actuators.
8. Sequence of operations.
9. Point lists.

B. Products Furnished But Not Installed Under This Section:

1. Section 15050 - Installation of control valves, flow switches, temperature sensor wells, gage taps, flow meters.
2. Section 15840 - Installation of automatic dampers including assembly of multiple section dampers with required interconnecting linkages, shafts, and brackets and extend required number of shafts through ducts for externally mounted damper motors. Jack shafts will be assembled with sealed roller or ball bearings of stainless steel construction.
3. Division 16 - Installation and connection of all power wiring. Power wiring is defined as follows:
   a. Wiring of power feeds through all disconnect starters and the variable speed controllers to electric motors.
   b. Wiring of remote start/stop switches and manual or automatic motor speed control devices not furnished by BAS Contractor.

C. Related Sections:

Section 15010 - Mechanical General Provisions.
Section 16010 - Scope of Electrical Work.

1.02 DEFINITION: As used herein, "BAS Contractor" means the Subcontractor for the Work of this Section.

1.03 BIDDING INSTRUCTIONS: The BAS systems as specified herein shall be provided in their entirety by the BAS Contractor. The BAS Contractor shall base its Bid on the systems as specified, the sequence of operations, and the points list.

A. Information: As part of its Bid, the BAS Contractor shall submit for review by the Owner's representatives a written description of its proposed BAS systems, including block diagrams showing all major components and panels, printers, and other processing devices and required cabling between each. Include environmental and space requirements for panels, CPU's, and other major devices.

1. Include manufacturer's literature for each type of panel, controller, or device that may be shown on the Riser Diagram.
2. Riser Diagram shall schematically show entire building system with major components identified.
3. System points list.

B. Type: Base the proposal on a completely DDC/electronic system, including wiring, conduits, and valve and damper actuators.

C. The final Contract Sum will be adjusted based on the actual number of VAV zones installed. Provide unit pricing (refer to Section 01270) for tenant DDC system for final pricing adjustment as follows:

1. VAV DDC Controller and Sensor: Furnish and install one VAV DDC controller, room sensor, air flow station, 24V transformer, Belimo 24V AC bi-directional damper operator, and connect to core and shell building management control system interface panel.

2. Fan-Powered VAV DDC Controller and Sensor: Furnish and install one Fan-powered VAV DDC controller, 2-stage heating control, room sensor, airflow station, 24V transformer, Belimo 24V AC bi-directional damper operator, and connect to core and shell building management control system interface panel.

1.04 QUALITY ASSURANCE:

A. Agency Listings:

1. UL 916 Energy Management Systems.
2. FCC-Part 15, Subparagraph J, Class A, Emissions requirements.

B. Work Involved: The BAS systems shall be provided completely under the Work of this Section, control components mounted and wired by BAS Contractor except as noted in Article 1.01 above. Engineering, installation, calibration, software programming, and check-out necessary for complete and fully operational BAS systems specified herein shall be performed by the BAS Contractor.

C. Qualifications: The BAS Contractor shall have a local office within a 50 mile radius of job site, staffed with factory trained engineers fully capable of providing instruction, routine maintenance and 24 Hour emergency maintenance service on all system components. The BAS Contractor shall have a five year experience record in the design and installation of computerized building systems similar in scope and performance to that specified herein, and shall be prepared to provide evidence of this history as a condition of approval prior to bidding.

1.04 WARRANTY: Conform to Section 01790. All BAS devices and installation shall be warranted to be free from defects in workmanship and materials for a period of one year. Any equipment, software, or labor found to be defective during this period shall be repaired or replaced without expense to the Owner. Factory authorized warranty service shall be available within 50 miles of the job site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: LONWORKS compatible products by CSI, Honeywell, or approved equal with an architecture supporting device interoperability and capability to network with existing CSI Building Automation System on site.

2.02 NETWORKING COMMUNICATIONS:

A. The design of the BAS shall be capable of networking new BAS at Fox Area One Office with existing CSI network serving other buildings on the Lot. The network architecture shall consist of a high performance peer-to-peer network and DDC Controller specific local area network with access being totally transparent to the user when accessing data or developing control programs. Communication gateway and link shall be provided to connect to the existing CSI BAS Network.

B. Peer-to-Peer Network: All operator devices either network resident or connected via dial-up modems shall have the ability to access all point status and application report data or execute control functions for any and all other devices supporting LonTalk common databases. No hardware or software limits shall be imposed on the number of devices with global access to the network data at any time.

2.03 GENERAL SYSTEM DESCRIPTION:

A. The Building Automation System shall improve HVAC reliability and enhance building efficiency while providing an easy to use interface for monitoring and managing the building. The Building Automation System shall provide the necessary Hardware, Software, and Network Communication abilities to provide:

1. Scheduling.
2. Monitoring.
3. Trending.
4. Historical storage and alarm functions for HVAC equipment and systems specified in Division 15.

B. Control capabilities shall include:

1. Time of Day scheduling.
2. Direct Digital Control.
3. Custom Control.
4. Boolean Logic.
5. Optimum Start/Stop.

6. Temperature Control.
7. After Hours Override.
8. Reports and Logs.
9. Remote Communications.
10. Alarm Logging.
11. Run Time and Maintenance.
12. Expanded Informational Messages.

C. Building Automation System shall allow full user operation with minimum of training. It shall have an English language display, with both user prompts and a "help" user tutorial. It shall contain management reports for the monitoring of both the current and historical energy usage, heating and cooling degree day, building status, and after hours occupancy information.

1. All applications programs shall be pre-engineered and pre-tested, program entries of the fill-in-the-blank editing format with English language prompting. This shall be verified by standard format programming worksheets included with the submittals.

2. A pneumatic control system consisting of air compressors, auxilliary devices, pneumatic floor loops and riser shall be provided for tenant pneumatic VAV zone control.

2.04 BUILDING AUTOMATION SYSTEM:

A. Type: Building Automation System (BAS) shall be composed of one or more independent, stand-alone unit controllers, microprocessor based master control panels.

B. Master Panels:

1. Master panels shall provide centralized control for distributed stand-alone unit controllers located on each major piece of HVAC equipment.
2. Master panels shall communicate with HVAC unit controllers and provide for the miscellaneous equipment points detailed in the points list.
3. Master panels shall be of modular design, allowing point expansion by addition of input/output cards.
4. Before Contract award, Building Automation System supplier may be required to document expansion points available in proposed system.

C. Each master panel memory shall be protected for a minimum of 30 days in the event of power failure. Internal clock shall continue to run during a power failure so the system makes the appropriate adjustment to all connected points when power is restored. If database is lost, provide rapid reprogramming means from an archive copy of the database.

D. Operating system of the master panels provided must manage communication signals, both in and out, to allow the panels to share real and virtual point information with each other and to allow central monitoring, central alarms, and editing of all panels from a single operator station as described below. The system of panels shall be programmable to autodial out upon system alarm, if required.

E. Binary outputs shall provide a continuous low voltage signal for on/off control of the remote devices. Where specified or indicated on the point list, outputs shall have three position manual override switch (On/Off/Auto), a status light, and shall be selectable for either normally open or closed operation.

F. Analog Outputs shall provide a modulating signal for control of remote devices. Outputs shall provide either 0 to 10 VDC or 4 to 0 milliamp output signal as required to provide proper control for the output device, Each Analog control point shall utilize a separate output. Sequencing of several actuators (i.e., heating and cooling, or economizer and cooling) is not acceptable.

G. Binary inputs shall allow monitoring on/off signals from remote devices. The binary units shall be compatible with commonly available signaling devices. All status points shown on point list or mentioned in unit sequence of operation shall be positive proof [differential pressure and/or current sensing] binary switches, sensing the medium being controlled.

H. Analog Inputs shall allow monitoring of variable, low voltage current, or resistance signals and shall have a minimum of a 12 bit resolution. The Analog Inputs shall be compatible with, and field configurable to, commonly available sensing devices.

I. Timed Override Switches: The system shall include the necessary switch hardware and corresponding inputs for the remote, timed initiation of after hours equipment operation in a building. Switch types an locations are as scheduled.

J. Alarms: BAS system shall provide audio, visual, contact closure, and remote telephone annunciation for:

1. Remote equipment failure.
2. Equipment run time.
3. Number of starts or date.
4. Program failure.
5. Card failure.
6. Sensor failure - each analog sensor and binary input and output shall be individually alarmed for values in excess of individual high/low limits or status.

K. System Diagnostics: System shall continuously check the status of all processor and memory circuits. Upon failure, the panel shall:

1. Switch equipment into pre-assigned failure mode per normally open/closed relay setting.
2. Emit alarm.
3. Display card failure identification.

2.05 BAS MASTER PANEL SOFTWARE:

A. Anti-Recycle Timer Protection: Provide a software program to allow each piece of equipment to be individually programmable with "minimum on" and minimum off" timer to protect HVAC equipment from rapid cycling due to a possible BAS operator or system error.

1. Minimum on/off timer program shall have priority over all application software functions except fire shutdown/smoke evacuation modes.
2. For BAS system start-up, set timers at 15 minutes or at an acceptable time as documents by HVAC equipment manufacturer.
3. Timers shall be individually programmable from 0 to 120 minutes.

B. User Access: Shall be through the use of a prompted, menu driven, English language communications routine.

1. System shall list program options from menu and directly access them.
2. System shall have a "Help" key in order to display instructions for the user at any time.
3. Communications routine shall be compatible with any ASCII based, RS232 compatible terminal.
4. User access shall be secured using individual security passwords for a minimum of eight users.
   a. Passwords shall have multiple levels of user access with data entry restrictions being assignable by password.
   b. User log on/log off attempts shall be recorded.

C. Time-of-Day Scheduling: The scheduling program shall have 32, eight-day (seven days plus Holiday) Master Schedules.

1. To these Master Schedules, up to 24 system loads (HVAC equipment, lights, etc.) or groups or loads, can be assigned.
2. The Master Schedules shall be individually editable for each of the days of the week and Holiday.
3. On any day, up to six time-of-day events shall be edited including:
   a. Equipment start and stop.
   b. Optimum start and stop.
   c. Duty cycle start and stop.
   d. Night purge cycle start.

D. Direct Digital Control Program: Shall allow modulating control of remote devices based on sensed data.

1. The control shall allow the combination of proportional, integral, and derivative control routines (PID Control).
2. Control routines shall allow full flexibility in setting parameters and provide ease of adjustment for non-technical operators.
3. Program shall include dynamic graphic display printout routine to indicate the status and real-time performance of the control loop.

4. Direct Digital Control loop setup and modification shall be performed through single pre-formatted edit screen, with parameters listed in English language.

E. Custom Control Language: The Custom Control Language capability shall be suitable for user written, real time, equation based custom control routines.

1. All binary or analog points in the system shall be available as inputs to custom routines.
2. Equation options shall include math functions such as: addition, subtraction, multiplication, division, square root, minimum, maximum, average; and logical function; and, or, greater than, less than, equal to, not equal to, less than or equal to, greater than or equal to, variable timing, and delays.

F. Optimum Start/Stop: The optimum start/stop program shall determine the required equipment start/stop timing by using inside/outside temperatures and the user's time-of-say schedule.

1. Optimum start/stop program shall run independently for each controlled load or zone.
2. Program shall automatically self adjust based upon historical data.

G. After Hours Override: Bas system shall start after hour operation through a remote binary input switch, a remote analog input mounted switch, and/or an operator keyboard command.

1. System shall be able to independently override a minimum of 27 timed override groups, each containing a minimum of four loads.
2. Program shall store override time in minutes for each group by month in an organized report format.

H. Run Time And Maintenance: The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts and/or calendar date limits. A minimum of 32 separate devices shall be monitorable under run time and maintenance.

I. Expanded Messages: The user shall be able to define a minimum of ten 40-character expanded messages for automatic printing in the event of system alarm and/or run time maintenance event.

2.06 PERIPHERAL HARDWARE:

A. CRT: Shall be a high-resolutions 17" 0.27 dp flat panel monitor with 256 colors, minimum; The system CPU shall have an Intel Pentium 4 2.0 GHz chip with minimum 256 megabytes of RAM and 30 gigabyte hard drive to support all graphics, reports, and communication requirements.

B. Printer: A remote inkjet printer and required cables shall be provided.

C. Telephone Modem: An autodial type telephone modem, associated cables and switching hardware shall be provided.

2.07 OPERATOR INTERFACE:

A. Dynamic/Interactive Color Graphics Software: Shall allow the display of dynamic real-time point data from the Master panels on operator created color graphic displays.

1. Graphics shall be created with the use of a mouse, joy stick, or a digitizer, and be able to display up to 256 colors simultaneously. As an option is shall be possible to import photo quality displays from 35mm slides.
2. The graphics package shall present dynamic information in the form of descriptors, values, and/or symbols.
3. Dynamic points are located on the graphic by using either a mouse or the keyboard as a pointing device.
4. Refresh of the dynamic information shall be manual and/or automatic with frequency of up to 5 seconds. A manual refresh mode alone is not acceptable.
5. Operator interface to graphic displays shall be controlled using a mouse and/or function keys, in conjunction with pop-up menu windows.
6. The package must both link graphics sequentially and directly access multiple displays from a single graphic, while in the graphics mode, the interface must also provide the interactiveability of manually overriding a point.
7. Graphic software must have access to complete remote panel program and data. Packages not offering these capabilities are not acceptable.

8. Notification of alarms from the panels must be provided on graphic display while system is in graphics mode. This notification will consist of a permanent alarm pending message (as part of display header), and a more specific removable pop-up message window.
9. A library of HVAC symbols shall be provided for use in generating custom displays.
10. Graphic symbols shall include fans, pumps, valves, chillers, air handlers, cooling towers, rooftops and self contained units.
11. Represent dynamic point information using symbols and provide a method to automatically display a different symbol in response to a dynamic point's change of state.

B. System shall automatically blank the CRT after a user designated duration of no-use in order to protect the CRT screen. The screen shall automatically be restored upon either an audible alarm or the use of the keyboard.

2.08 USER EDITING CAPABILITIES:

A. English language based user programming shall allow a user to examine and change all panel data.
B. Operator interface shall be controlled using a mouse and/or function keys. Graphics package shall have prompts on the displays for system function keys.
C. There shall be three levels of security. The security system shall have a minimum of six users, each with a designated three letter operator ID and a four character password.
D. System shall protect itself from unauthorized use by automatically logging off following last keystroke. The delay time shall be user designated.
E. All program set up must be through a fill-in-the -blank editing format following system prompts. Packages requiring programming or logic statements to set are unacceptable.
F. For ease of system operation, a HELP directory describing system operation shall be provided.

2.09 TELEPHONE OPERATION (DIAL UP CONNECTION):

A. The system shall allow electronic downloading and storage of templated applications programs for use in remote panels.

B. After Hours (Night Time) Alarm Processing: Provide software that will report an alarm message during unoccupied hours and transfer the alarm message to an alternate location equipped with terminal device and an auto-answer modem. Telephone number of the alternate location, and time of day to start and stop transfer of alarm message shall be user designated

2.10 DIAGNOSTICS:

A. Central System Alarm Operation: When a panel reports the alarm message. software shall automatically store the message and notify the user by printing the alarm message, sounding an audible tone in personal computer, and flashing an alarm message on the CRT.

B. System Alarm and Trouble Shooting Library: Create a report with displays containing the symptom and diagnosis trouble shooting guides for the HVAC system equipment. Compile and enter Equipment symptom and diagnosis information from manufacturers operations and maintenance manuals. When equipment fail alarm is received, allow printing of report to assist maintenance personnel in trouble-shooting.

C. Self-Diagnostics: Software shall initiate system self-test that notify the operator of any detected failures. All panels failing to respond shall be identified on a display printout.

2.11 REPORTS AND LOGS: The system shall include the capability to store for user review and for printing, the following reports and logs. In addition, these reports shall be saved to diskette as an ASCII file for use by other Owner-furnished software packages.

A. Current summary report - instantaneous summary of building status including heating and cooling degree days, on and off peak electrical demand performance, current electrical KWH consumption, and summary for critical temperature sensors listing current, today's minimum and today's maximum values.
B. Monthly summary report - an end of month summary of building status including heating and cooling degree days, on and off peak electrical demand performance, current electrical KWH consumption, and summary of critical temperature sensors listing the month's minimum and maximum values.
C. Yearly degree day report - a current month's and previous 12 month summary of heating and cooling degree days.

D. Weekly temperature report - a previous seven day's summary of minimum and maximum temperatures for the critical zone temperature sensors.
E. Weekly override time report - previous seven day's summary of after hours override usage (in hours and minutes) for the 27 timed override groups.
F. Monthly override time report - a current and previous month's summary of after hours override usage (in hours and minutes) for the 27 timed override groups.
G. Trend logs - a total of 32 custom reports that allow storage of up to 24 samples of a sensed value based upon a schedule basis.
H. Event log - Track 100 system events including alarms, operator log-on, and diagnostics.
I. Input/output status reports - allows operator review of all points and their status in the system.
J. HVAC equipment reports - automatic, pre-formatted reports, that indicate the control status and status of all input/output points of the connected air conditioning equipment.
K. Custom reports - up to 19 reports, each containing the status of up to 20 user designated points. Reports shall provide a simple method to group related points into a single report.

2.12 APPLICATION SPECIFIC CONTROLLERS: Where Application Specific Controllers are applicable, provide stand-alone microprocessor based Direct Digital Controllers..

A. Provide one Application Specific Controller for each item of controlled equipment. The controller shall be pre-programmed, tested, and factory mounted on the mechanical equipment to ensure reliability. If factory mounting is not possible, controllers shall be factory programmed and tested prior to shipment to the job site.

1. The controllers shall be clearly labeled as to controller type, where it is to be installed, and software address.
2, The controller shall be fully tested upon installation to ensure that it is properly matched to the equipment it is controlling.
3. The controller shall communicate with other devices on the communication network and be fully integrated with the other system components.

B. Where specified in the sequence of operations, the controller shall have a display and keypad for local interface with the mechanical equipment.

1. Keypad shall be provided for interrogating and editing data. Display shall be backlit LCD.
2. System security password shall be required to use keypad and display.
3. Keypad and display shall be mounted at the unit or where specified.
4. A portable service tool is acceptable, but must be permanently mounted at the location specified for the keypad and display.

C. The hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient shall be mounted in waterproof enclosures and be rated for operation at -40°F to 158°F.
2. Controllers used in conditioned ambient shall be mounted in dustproof enclosures.

2.13 CUSTOM APPLICATION CONTROLLERS: Custom Application Controllers shall provide stand-alone control requiring no additional system components for complete operation.

A. All programming required for operation shall be memory resident and shall be retained in the permanent memory. Powered or battery backed up memory is not acceptable.

B. Custom Application Controller shall be so configured the portable operator interface can be plugged directly into it (or within sight) for programming, editing, and other operator functions.

1. A local keypad shall be provided (as described in Paragraph 2.12C above) where specified.
2. Controller hardware shall be suitable for anticipated ambient conditions as described in Paragraph 2.12C above.

2.14 MISCELLANEOUS:

A. Duct-Mounted Control Dampers shall be designed to operate in systems with velocities up to 3,000 FPM with a static pressure differential of 4" WG. Frame shall be minimum 16 gauge galvanized steel roll formed channel. Blades shall be minimum 16 gauge galvanized steel with a maximum width of 8". Shafts shall be minimum 1/2" diameter. Maximum damper sections size shall be 48" by 72", with larger damper installed in sections with appropriate jack shafting.

1. All multiple blade duct mounted proportional control dampers shall be opposed blade type and all two-position dampers shall be parallel or opposed blade type.
2. Duct mounted dampers shall be minimum leakage type equipped with blade and edge seals.

B. Actuators: Electronic valve and damper operators shall be the positive positioning, spring return type. Motors shall be of the low voltage synchronous type and shall be non-overloading at a continuous stall. Actuators shall be factory selected, mounted, and tested for proper operation based on unit size, type, and torque requirements.

C. Control Valves: Electronic, positive positioning, spring return, and low voltage (24 VAC) actuators, properly selected for the valve body and service. Valve bodies to be 3-way mixing, 2-way normally open or normally closed to suit application. Bodies 2" and less to be 250 psig bronze, screwed connection, with bronze seats, equal percentage plugs, stainless steel stems with Teflon packing. Over 2" size, bodies to be 125 psig iron, flanges connection with modified equal percent plug. Valve selection to be based on minimum 5 psig drop across fully open valve.

D. Electro Control Wiring: Conduit and wire shall be furnished and installed under this Section in accordance with requirements of Division 16.

2.15 POWER MONITORING: Provide power monitoring at each sub-panel via current transformer (one per phase) for amperage readings of power draw at the panel.

A. Electrical Subcontractor shall furnish and install the current transformers and line voltage wiring and conduit.

B. Control Subcontractor shall furnish and install low voltage wiring and conduit including termination of control wiring at the DDC panel.

2.16 LIGHTING CONTROL: The Lighting Control System will consist of Microprocessor-based Lighting Control panels connected to the BAS Network. At the Operator Workstation, the operator can monitor lighting point status and override program times.

A. Lighting control panels shall manage lighting circuits according to time schedules and shall be located at each electrical room.

B. Each lighting control panel (LCP) shall be furnished and installed with the following features:

1. Minimum twelve (12) individual lighting zones per LCP.
2. Emergency bypass switches at the LCP to manually turn on each individual zone.
3. Flashing the tenant lights one minutes before they are scheduled to go off.
4. Capability to accept 12 inputs per panel from zone override input switches that turn on individual zones for a preset period of time.
5. Easily changing a circuit/zone program assignment.
6. Lighting control relays shall be SPDT, 20 amperes, 277 volt, 3-wire control. G.E. RR-7 or equal.

C. Transformers:

1. 24 volt output, approved Class II design with secondary fusing.
2. Transformer size as required to operate all relays.
3. Provide D.C. rectifier unit for each transformer.

E. Terminal Blocks:

1. Provide terminal blocks for all 24 volt wiring terminations from all relays. Provide 10% spare terminals.
2. 24 volt control leads from each relay shall be connected to terminal blocks and identified.

F. Wiring:

1. 24 volt wiring shall be #20 AWG minimum size, 300 volt insulation. Power wiring to the lighting control panels (LCP) will be provided by Division 16. Power wiring from the (LCP) to the developed spaces will be future.
2. The required conduit and wiring from the lighting power panel to the lighting control panels will be provided under work of Division 16.

2.17 SEQUENCE OF OPERATIONS:

A. Built-up Air Handler :

1. Start/Stop/Scheduling: The built-up air handler shall be started and stopped based on an occupied and unoccupied schedule. Upon fan shutdown, the outside air damper shall close.

2. VFD: When the air handler is running, the VFD shall vary supply fan speed to hold a desired duct static pressure. The desired static pressure shall be adjustable. Sensor shall be located 2/3 downstream of the main duct. A secondary building pressure controller, with static pressure sensor located at the Ground Floor Lobby, shall modulate the return fan VFD to maintain a slight positive space pressure.

3. Economizer Control: In order to optimize energy conservation, economizer cycle shall allow only enough outside air in the cooling cycle to satisfy the space temperature during the period of mild ambient conditions. Outside air damper shall return to its minimum position when outside air high limit setpoint is reached.

4. Cooling Set Point: When the air handler is running, the chilled water valve shall modulate to maintain a maximum supply air temperature setpoint.

5. Morning Warm-up Cycle: When the air handler is started, if the return air temperature is less than 65 degrees F, the system shall activate the morning warm-up cycle as follows: The outside air damper shall remain closed, the cooling shall be disabled and heating shall be activated, the VFD shall be set to maximum air, and VAV boxes shall be opened to maximum air flow with electric heaters on 100%. When the return air temperature rises above 70 degrees F, the system shall revert to the normal control sequence as described in the above paragraphs. During this mode, the cooling coil valve will be closed.

B. Elevator Machine Room: Elevator Machine Room AC unit shall be started and stopped by its own integral temperature control. Provide high temperature alarm and AC unit status at the BAS.

C. Miscellaneous Equipment Sequences

1. Exhaust Fan Control - The BAS shall start the exhaust fan through software according to the interlock schedule located on mechanical drawings.

D. Garage Area Carbon Monoxide System: Carbon Monoxide Sensors located in the Garage Area shall be monitored by the BAS System. When the level exceeds the setpoint (adjustable) the system will enable the Garage Supply and Exhaust Fans Variable Frequency Drives and modulate them to maintain setpoint.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS: All electrical work performed in installation of the BAS system specified herein shall be per the National Electrical Code (NEC) and per applicable state and local codes. Where exposed, conduit shall be run parallel to building lines properly supported and sized at a maximum or 40% fill. In no cases shall field installed conduit smaller than 1/2" trade size be allowed. Where conductors are concealed (tenant spaces), cable rated for use in return air plenums shall be used if approved by City of Los Angeles.

3.02 OWNER TRAINING: BAS Contractor shall prepare and submit an operator's and maintenance manual in accordance with Section 01770 describing all operating and routine maintenance service procedures for temperature control and Building Automation System supplied, and instruct Owner's designated representatives in these procedures during start-up and test period. Duration of the instruction period shall be no less than 36 hours, during normal working hours.

3.03 CALIBRATION AND ADJUSTMENTS: After completion of installation, perform final calibration and adjustments of the equipment provided under this Section and supply services incidental to proper performance of the ATC and BAS system under the specified warranty.

3.04 ACCEPTANCE PROCEDURE: Upon completion of calibration, Contractor shall start-up the system and perform all necessary testing and run diagnostic tests to ensure proper operation. Contractor shall be responsible for generating all software and entering all database necessary to perform the sequence of control and specified software routines. An acceptance test in the presence of Owner's representative of Engineer shall be performed.

END OF SECTION

SECTION 16100

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 applies to this Section. Provide the basic electrical materials and methods as indicated, specified, and required, complete

A. Work Included: The following list is not to be construed as complete. Included are the following:

1. Electric service installed in accordance with requirements of serving utility company.
2. Telephone service installed in accordance with requirements of the serving telephone company.
3. Lighting system installed in interior areas and exterior areas.
4. Power system installed including interior areas and exterior areas.
5. Line and low voltage control circuits for operation of Heating and Ventilating, Air Conditioning, and Plumbing Systems as defined on the Drawings and specified in Division 15 - Mechanical.

B. Related Work:

1. Section 07600: Flashing and Sheet Metal.
2. Division 15: Heating, Ventilating, and Air Conditioning.

1.02 SUBMITTALS: Refer to Section 01330 for procedures.

A. Product Data: Submit copies of material list.

B. Shop Drawings: A minimum of six copies of Shop Drawing materials shall be submitted in bound, indexed packets. All copies shall be identical in content, order, and presentation. Additional copies shall be submitted as required for project administration or as defined by Architect. Submit Shop Drawings for electrical items (except installation materials) such as, but not limited to, the conduit fittings, outlet boxes, 600 volt conductors, and wiring devices.

1. Check Shop Drawings for space requirements and conformance with Contract Documents.
2. Shop Drawings shall indicate the interrupting rating of type of equipment proposed, switchgear elevations and dimensions, single line diagrams, bus sizes, motor control center starter types and wiring diagrams, fuse AIC rating and class.

C. Studies: Submit six certified copies of the following:

1. A System Short Circuit Study based on an infinite bus (on primary side of high voltage transformer) and on the per unit method or in accordance with the latest Institute of Electrical and Electronics Engineers, Inc. (IEEE) recommendations. Reports shall be submitted during the submittal period. This study shall show that all equipment proposed shall be rated to exceed the maximum ultimate fault current level available at the point of application by at least 10% (series connected rating is not acceptable). This study shall be submitted before or with all switchgear and panels, transformers. This study may be carried out by a registered electrical engineer from the switchboard manufacturer. The cost of this study shall be included as part of the Contract Sum.

2. A Coordination Study of all protective devices, including the utility protective device through all feeder devices on the secondary of each transformer. Study to be presented on LOG-LOG paper. Upon review of the study, the Contractor shall set devices at agreed-upon settings and provide a data sheet to Architect and a copy to the Owner, indicating final settings for all adjustable devices. The coordination study shall be submitted with short circuit study and before feeders are being installed on site. This study shall be carried out by the switchboard manufacturer. The cost of this study shall be included as part of the Contract.

D. Additional Submittals Required:

1. Manufacturer's printed instructions for operation and maintenance of the electrical equipment, including replacement parts lists. Each set shall be bound in an indexed loose leaf ring binder with permanent cover and permanent identification on edge.
2. Service and Operating Manuals for all equipment; prepare as specified in Section 01330.
3. Three-phase voltage test.
4. Report showing test voltage L-N on the secondaries of all transformers.
5. Grounding systems tests.
6. Test reports.
7 Factory tests.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements:

1. Comply with State Electrical Safety Orders and local codes and ordinances.
2. Materials shall be listed by Underwriter's Laboratories, and shall bear the Inspection Label.
3. Materials shall meet with approval of the Division of Industrial Safety, State of California and all governing bodies having jurisdiction.

B. Electrical Power and Telephone Services: Electrical power and telephone services and metering facilities shall conform to requirements of serving Utility Companies and shall meet with the approval of local and State inspecting authorities.

C. Electrical Acceptance Tests.

1. General Scope:

a. As part of the Contract, Contractor shall perform tests of installed work as herein specified and specified in other Sections of Division 16.
b. The Contractor shall provide all materials, equipment, labor, and technical supervision to perform such tests and inspections.
c. All tests shall be performed in compliance with the recommendations and requirements of National Electrical Testing Association, Inc., (NETA), and applicable codes and standards.
d. Upon completion of the tests and inspections noted herein, a label shall be attached to all serviced devices. These labels shall indicate date serviced and service company responsible.
e. The tests and inspections shall determine suitability for continued reliable operation.
f. All tests shall be conducted in the presence of the Architect.

2. Test Reports: Shall include:

a. Description of equipment tested.
b. Description of test.
c. Test results.
d. Conclusions and recommendations.
e. Appendix, including appropriate test forms.
f. List of test equipment used and calibration date.

D. Materials Standards: Materials and equipment shall be new.

1. All electrical work shall meet the requirements of the following:

a. National Electrical Manufacturer's Association (NEMA).
b. American National Standards Institute (ANSI).

c. Institute of Electrical and Electronic Engineers (IEEE).
d. Institute of Cable Engineers Association (ICEA).
e. National Electrical Contractors' Association Standards for Construction (NECA).
f. Underwriters' Laboratories, Inc. (UL).
g. California Code of Regulations (CCR) Titles 8, 19, 22 and 24.
h. California State and Local Fire Marshal.
i. Instrument Society of America (ISA).
j. California Electrical Code, (T-24, latest edition).
k. National Fire Protection Association (NFPA).
l. State Industrial Accident Commission.
m. Uniform Building Code, latest edition (UBC).
n. Occupational Safety and Health Appeals Board (OSHA).

2. Items for similar application shall be of the same manufacturer.
3. The label of listing by UL shall appear on all materials and equipment for which standards have been established by the agency.
4. Where codes establish label or approved requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.
5. Provide the type and quantity of electrical materials and equipment necessary to complete work and all systems in operation, tested and ready for use.
6. Provide all incidental items that belong to the work described and which are required for complete systems.
7. All switchgear, switchboards, distribution boards, panelboards, circuit breakers and transformers shall be of the same manufacturer.

1.04 PRODUCT HANDLING: Deliver materials to job site in original unbroken package, properly tagged with UL Label, size, type, and manufacturer indicated or specified.

1.05 PROJECT CONDITIONS:

A. Location and Routing: The Drawings indicate diagrammatically the desired location or arrangement of outlets, equipment, etc., and are to be followed as closely as possible. Judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions. The Contract Documents are not intended to show every detail part, support, final connection, accessory, or every structural difficulty that may be encountered during the work. Except as otherwise indicated, locations of items are approximate only. Exact locations necessary to secure proper conditions and results shall be determined at project site and shall be approved by the Architect.

1. Locations shown on Architectural Ceiling Drawings or on wall elevations shall take precedence over electrical plan locations.
2. Verify dimensions and the correct location of equipment before proceeding with the roughing-in of connection.
3. Lighting fixtures in mechanical spaces and elevator machine rooms are shown in their approximate locations only. Do not install light outlets or fixtures until mechanical piping and ductwork are installed; then lighting fixtures shall be installed in locations best suited for equipment arrangement and as approved by the Architect. Verify locations of fixtures in elevator machine rooms before installation.

B. Dimensions: All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc., with the Drawings to see that the equipment being installed will fit into the spaces provided.

C. Access to Equipment: Locate starters, switches, receptacles, cable tray and pullboxes to provide easy access for operation, repair, maintenance to comply with code, and if concealed, provide access doors.

D. Equipment Sizes: The Contractor shall be responsible for verifying that equipment being provided will fit dimensionally in locations shown on Drawings.

E. Discrepancies: Notify the Architect in writing of any dimensional discrepancies and of other conditions detrimental to proper performance of the Work.

1.06 WARRANTY AND GUARANTEE: Conform to Section 01790. Warrant and guarantee all work of this Section for one year.

1.07 TRAINING: Provide a period of 20 hours for the necessary training program and instructions to the Owner's personnel for entire Building Electrical System in addition to what is specified in each Section.

PART 2 - PRODUCTS

2.01 MATERIALS: Provide only prime quality, new materials, apparatus, and equipment).

A. Conduit:

1. Rigid Conduit: Shall have UL Label, zinc coated exterior, either hot dip galvanized, sherardized, or metallized, and zinc enamel interior; set screw fittings are not permitted.

2. PVC Jacketed Conduit: Rigid steel conduit and fitting with a 20 mil extruded polyvinyl chloride jacket and internal galvanized surface. The jacket shall have high tensile strength, shall be highly resistant to corrosion and shall not oxidize or deteriorate or shrink when exposed to sunlight and weather. The jacket shall be flame retardant and shall not support combustion, UL label.

3. Electrical Metallic Tubing: UL Label, zinc coated exterior and zinc or enamel interior; fittings for EMT shall be steel gland ring compression type. Type AC cable shall not be used. Type MC cable may be used as a deductive alternate upon approval and where permitted by Governing Authorities; see Deductive Alternatives section herein.

B. Flexible Metallic Conduit: UL Label, zinc coated exterior and interior; fitting for flexible conduit shall be "JAKE" or Squeeze type, set screw connectors shall not be used.

C. Liquid-Tight Flexible Conduit: Shall be Sealtite type U.A. with Appleton Series "ST" or Pyle-National Series "CT" connectors.

D. Non-Metallic Conduit: Shall be Type I per UL 651, and shall be equivalent to "PVC Schedule 40" as manufactured by Carlon. All sweeps, bends, and risers shall be concrete encased schedule 80.

1. All high-voltage conduit, telephone conduit, service entrance conduit, and feeders 100 amps and over shall be encased in 3" red, mixed concrete when buried in site.
2. Non-metallic flexible tubing shall not be used.

E. Sealant: Fire rated equal to wall or ceiling penetrated. Silicon foam, Dow-Corning #2001, General Electric Co., "Pensil #851," or approved equal.

F. Conduit Seals: Shall be Crouse-Hinds Type "EYS" or "EZS", Appleton Type "ESUF" or ESUM", or approved equal, with sealing compound as recommended by the manufacturer for hazardous or refrigerated areas.

G. Racks and Trapeze Hangers: Formed steel channels similar to Unistrut.

H. Vibration Fittings and Seismic Expansion Joints: O.Z. Type DX. Provide seismic couplings/joints as required per code.

I. Outlets and Junction Boxes:

1. Galvanized or sherardized, one piece pressed steel, knock-out type.
2. Size of each box determined in accordance with NE C for number of conductors or number and size of conduits entering box, but not less than 4 in. square and 1-1/2in. deep.
3. Telephone outlet boxes - minimum of 4in. square and 2-1/8in. deep.
4. Outlet boxes installed in concrete for fixtures, 4-3/8in. octagonal concrete box with a minimum depth of 2-1/2 in.
5. Outlet boxes installed in concrete for wiring devices - 4in. square and 1-1/2in. deep concrete box with 1-1/4in. deep cover plate.
6. Exposed outlet boxes - cast metal with threaded or union hub, Crouse-Hinds type "FS" or "FD" with cast metal covers.
7. Outlet boxes installed in masonry walls - masonry type with square corners and without exterior mounting ears or standard 4S box with 2in. masonry extension ring. Mounted in conjunction with coursing.

J. Pullboxes: In no case of less size or material thickness than required by governing electrical code.

1. General purpose sheet steel pull boxes - furnished with removable screw covers; manufacturer's standard baked enamel finish.
2. Weatherproof sheet steel pullboxes - fabricated of code gauge hot-dipped galvanized steel and gasketed weather-tight cover of same materials; manufacturer's standard baked exterior enamel finish.
3. Cast metal pullboxes - furnished with gasketed screw covers and necessary drilled and tapped conduit entries; screws shall be bronze or brass.

K. Floor Mounted Outlets and Boxes:

1. In floor boxes mounted in slabs on grade to be watertight cast iron boxes with number of gangs per plans, combine all floor receptacles, telephones and data outlets at a single location into one floor box U.O.N. All boxes shall be 3-3/8" deep with 1-7/8" minimum adjustment before pour and 1/2" adjustment capability after pour. Boxes shall be finished out flush with final floor finish. Boxes shall be as manufactured by Walker or approved equal as follows:

Gang	880CS1
Gang	880CS2
Gang	880CS3

2. In floor boxes mounted in slabs above grade level to be concrete tight stamped steel with number of gangs per plans. Combine all floor receptacles, telephone and data outlets at a single location into one floor box U.O.N. All boxes shall be 3-15/32" deep with 2" minimum adjustment before pour and 1/2" minimum adjustment capability after pour. Boxes shall be finished out flush with final floor finish. Boxes shall be as manufactured by Walker or approved equal as follows:

Gang	880S1
Gang	880S2
Gang	880S3

L. Boxes Finishes:

1. Box trim plates shall match final floor finish in area installed.
2. Hard finish floors shall use brass tile rings. Walker #817T, 827T and 837T or approved equal as appropriate.
3. Carpet finished floors shall use brass carpet flanges. Walker #817C, 827C, 837C or approved equal as appropriate.
4. Receptacle covers to be Walker #828R.

5. Tele/data covers to be Walker #829S.
6. Partition feed covers to be Walker #829CK-1.

M. Poke Through Type Infloor Outlets:

1. All poke throughs are to be fire rated to match floor being penetrated. Verify floor fire rating prior to installation. Coordinate all floor penetration locations with project structural engineer in writing prior to core drilling penetration. In any buildings with post tension slabs the floor shall be x-rayed prior to core drilling.
2. Poke throughs shall be Walker #1570-A (duplex receptacle), Walker #1990-A (Quadplex receptacle), Walker 15AM Series for tele/data outlets, coordinate exact jack type(s) with Owner's telecom installer prior to project completion.
3. Poke through for partition furniture fees are to be Walker #1620-PF50/75 or approved equal.

N. Tele/power Poles: All tele/power poles shall contain devices as shown on the Drawings. Tele/power poles shall be Wiremold 25DTP series or approved equal.

O. Wire and Cable - 600 Volt Conductors:

1. Conductor size: #12AWG minimum.
2. Conductors #10AWG and smaller shall be solid.
3. Conductors shall be copper. Aluminum conductors shall not be used.
4. Type TW or type THHN 600 volt insulation shall be used for conductors #8AWG and smaller in dry locations.
5. Type THW, 600 volt insulation, shall be used for conductors #4 and smaller installed exterior to building below grade and in wet locations.
6. Type THW 600 volt insulation for conductors No. 6 AWG and larger and panel feeder conductors.
7. Silicone insulated, 125°C wire shall be used for circuit conductors installed in fluorescent lighting fixture raceways, for conductors connected to secondary of fluorescent or mercury vapor fixture ballasts and other hot locations such as conduit exposed to weather.

P. Adhesive Marker: "Brady" as distributed by Graybar Electric.

Q. Distribution Switchboards:

1. Switchboards shall consist of one or more vertical sections bolted together to form one free floor standing sheet metal enclosure designed in accordance with U.L. standard U.L. 891 for dead-front, dead-rear switchboards, NEMA PB-2, 90" high.
2. Switchboard shall include devices shown on instrumentation and control wiring, terminal blocks and pressure type line terminals, suitable for either copper or aluminum conductors; provide groups of control wire leaving switchboard with terminal blocks with suitable numbering strips.
3. Provide full length tin-plated aluminum bus bars with cross-bussing. Locate cross-bus at rear of vertical bus midway between top and bottom of structure. Cross bussing at top or bottom of sections is not acceptable. Rating of vertical bus shall match cross-bussing rating.
4. Verify short circuit current available with Power Company. Provide circuit breakers with properly coordinated and adequate interrupting capacity. Short circuit rating of switchboard shall be stamped on manufacturer's nameplate.
5. Rodent proof ventilation as required to maintain allowable temperature rise at rated capacity.
6. Switching and protective devices with visible means of ON-OFF identification.
7. Verify top or bottom entry and instruct equipment supplier.
8. Submittals to include voltage/current rating, short circuit rating of board and devices, overall dimensions, available conduit space, circuit schedule, circuit numbers, device rating and description, conductor ratings, one-line diagram with circuits numbered, nameplate schedule, equipment weight, motor center and control panel internal and interconnecting wiring diagrams, certification and conformance.

9. On exterior provide outdoor construction with fully accessible, gasketed weatherproof front doors with 3- point latch and lock. Design outgoing cable and/or bus connections to maintain weather-proof integrity of gear.
10. A-B-C bus arrangement throughout, left to right, top to bottom, and front to rear.
11. Bus assembly to maintain UL clearances.
12. Full length equipment ground bus secured and bonded to each section of board, with terminals for feeder ground connections.
13. Fully rated neutral bus insulated from ground for all grounded neutral boards with a removable neutral bus link.
14. Ground fault protection on main breakers for 480 volt switchboard and where shown, coordinated so that load breakers trip before main breakers.
15. Zero sequence type ground fault protectors, where not otherwise specified. Relay, field adjustable from 100-1200 amperes for main and up to 20% of frame for branch devices, and adjustable delay from 6 to 30 cycles. Solid-state circuitry to shunt trip breakers. Monitor panel on face of switch board with READY pilot light, ground fault indicator, reset button, provisions for field test without service interruption and alarm contact. Associated high temperature control wiring, isolated with barriers. Provide breakers with integral ground sensors in lieu of separate zero sequence type.
16 Circuit breakers:
    a. Acceptable manufacturers: General Electric, Westinghouse, I.T.E., Square D.
    b. Each circuit breaker or other device shall be identified with white on black (black letters), by 2-1/2 in. laminated plastic nameplate engraved as designated by Architect.
    c. Each circuit protective device shall be provided with provision for padlocking in the "OFF" position.
17. Switch and fuse units: Quick-make, quick-break type with current-limiting fuses.
18. Switchboards shall be completely assembled and wired at the factory. Acceptable manufacturers: General Electric, Westinghouse, I.T.E., or Square D.

R. Motor Control Centers - Commercial Type:

1. Motor control centers shall be G. E. 8000 Series or equal with circuit breakers, starters and devices provided as indicated on mechanical control wiring diagram or motor control center single line diagram. Review electrical and mechanical plans for requirements.
2. Install control transformer and secondary fuse or circuit breakers in separate compartments.
3. Wiring: Class I, Type B.
4. Combination starter units size #2 and smaller shall be plug-in type. Starter and disconnect shall be mounted on removable saddle. Door shall close and lock. Provide the unit without interlock with means for padlocking door and operating handle in "OFF" position.
5. Circuit breakers, starters, and control device acceptable manufacturers: General Electric, Westinghouse, I.T.E., or Square D. Each compartment shall be identified with white on black (black letters), 1 in. x 2-1/2 in. laminated plastic nameplate engraved as designated by the Architect and mounted by rivets or screws.
6. Provide circuit breakers with properly coordinated and adequate interrupting capacity for short circuit current available. UL listed short circuit rating of the control center shall be stamped on manufacturer's nameplate.
7. Motor control center shall be completely assembled and wired at the factory. Acceptable manufacturers: General Electric, Westinghouse, I.T.E., or Square D.

S. Panelboards:

1. Panelboards shall be 42-pole, flush or surface mounted with main and branch circuit breakers or spaces. Where indicated panelboards shall be furnished with weatherproof cabinets, split bussing, contactors, relays, time switches and barriered compartments. Where exposed to wet locations or weather, panelboards shall be rated NEMA 3R.

2. Boxes shall be Electrical Code gauge galvanized steel sized to provide 4in. minimum side gutters and 6in. minimum top and bottom gutters. If double lugs are shown, bottom gutter shall be 12in. wide. Boxes shall be 5-3/4in. deep. Coordinate wall thickness with flush mounted panels.
3. Front panels shall be sheet steel, painted manufacturer's standard if surface mounted and prime-coat finished if flush mounted. Provide front panel doors with semi-concealed hinges, directory cardholder, card, catch and lock. Branch circuits shall be clearly marked on dead-front shield or on branch circuit breaker. Provide front panel with white on black (black letters), 1in. x 2-1/2in. laminated plastic nameplate engraved as designated by Architect and mounted by rivets or screws. On flush panels, mount nameplate on dead-front shield.
4. Support panel frame to withstand effects of short circuit current. All terminals shall be solderless type suitable for copper or aluminum conductors numbered to agree with branch circuits.
5. Circuit breakers shall be bolt-on, quick-make, quick-break common trip units and shall have short circuit interrupting rating in excess of the available fault current. All branch circuit breakers shall have individual provisions for padlocking in "OFF" position.
6. Acceptable circuit breaker manufacturer: Square D, General Electric, Westinghouse, or I.T.E.
7. Acceptable panelboard manufacturers: General Electric, Westinghouse, I.T.E., or Square D.

T. Terminal Cabinets:

1. Terminal cabinets shall be flush or surface mounted as indicated. Where indicated, cabinets shall be of weatherproof construction.
2. Cabinets shall be code gauge galvanized steel sized and provided with barriers indicated. Install 3/4in. plywood backboard, painted black, in each cabinet with adequate type terminals.
3. Front panels shall be of sheet steel, painted to match lighting panels if surface mounted and prime coat finished if flush mounted. Provide front panel doors with semi-concealed hinges. Front panel shall be provided with a white on black (black letters), I in. by 2 1/2 in. laminated plastic name plate engraved as designated by the Architect and mounted by rivets or screws. On flush cabinets mount nameplate inside of panel door.
4. Cabinets shall be UL listed.
5. Acceptable cabinet manufacturers: General Electric, Westinghouse, I.T.E., or Square D.

U. Magnetic Starters:

1. Provide two or three overload relays respectively for two-pole or three-pole starters.
2. All starters of the same make. NEMA rating with overload heaters sized according to 115% of the nameplate rating of actual motors installed.
3. Overload relays shall be bimetallic type.
4. Auxiliary contacts, pushbuttons, selector switches, pilot lights, as required by heating, ventilation, air conditioning and plumbing system. Acceptable manufacturers: General Electric, Westinghouse, or Allen-Bradley.

V. Manual Motor Starters:

1. Flush or surface mounting type as required, number of poles, size, and overload heaters required by size of motors actually installed.
2. Acceptable manufacturers: General Electric, Westinghouse, or Allen Bradley.

W. Circuit Breakers (molded case):

1. Operating mechanism with contacts, arc interrupter, and trip elements for each pole, enclosed in molded-phenolic case.
2. Operating mechanism shall be of quick-make, quick- break type and shall be entirely trip free so that contacts cannot be held closed against short circuit or overload.
3. Operating handle of circuit breaker shall open and close all poles of multi-pole breaker simultaneously.

4. Circuit breakers shall be constructed with durable silver alloy contacts and deionizing arc quenchers.
5. Circuit breakers shall be frame size shown on the Drawings and shall meet NEMA and UL specifications.
6. Each circuit breaker shall have thermal magnetic trip unit for each pole consisting of thermal bimetallic element for short circuit protection.
7. Circuit breakers in lighting type panelboards up to 50 ampere ratings shall be temperature compensated to carry their rated current at ambient temperature of 40°C.
8. Other circuit breakers shall be ambient temperature compensated to carry rated current at 50°C. .
9. Elements shall operate common trip bar which will open poles in case of overload or short circuit through any one pole.
10. Circuit breaker shall be trip indicating, with tripped position of breaker handle midway between ON and OFF position.
11. Circuit breakers shall have AIC rating in excess of available fault current.
12. Circuit breakers shall indicate the trip-rating so as to be clearly visible with dead-front on panel.
13. Circuit breakers shall be manufactured by G.E., Westinghouse, I.T.E., or Square D.

X. Transformers:

1. Transformers shall be of KVA and voltage rating as indicated on the Drawings.
2. Transformers shall be indoor dry type 480V 208Y/120V unless otherwise noted.
3. Transformers shall be constructed to the following standards:
   a. Underwriter's Laboratories Specification UL 506
   b. ANSI and NEMA test standards
   c. AIEE Class "H" or NEMA Group III with maximum ambient of 40°C.
4. Transformers shall have four full-capacity 2-1/2% taps, 2 above and 2 below nominal voltage.
5. Transformers shall be grounded with code-sized ground to code approved ground unless otherwise noted.
6. Bolt floor-mounted transformers to floor using rubber isolation mounts as required so that no metal-to-metal contact points occur.
7. Performance test data shall be provided with transformer submittals for the following:
   a. Sound levels
   b. Temperature
   c. Full Load Losses
   d. Regulation
   e. Impedance
8. Acceptable manufacturers - G.E., Westinghouse, I.T.E. or Square D.

Y. Disconnect Switches: Non-fusible or fusible, externally operated horsepower-rated 250 volt or 600 volt as required; NEMA Type 1 enclosure except where WP is indicated, use NEMA Type 3R enclosures.

Z. Time Switches:
1. For control of lighting through relays or contactors use 120 volt, or 277 volt as indicated, 60 cycle single-pole, double-throw contacts in conjunction with ASCO Bulletin 1255- 166 relays.
2. For direct control of lighting through time switch use 120 volt, or 277 volt as indicated, 60 cycle 35 amp contacts, double pole, single throw Paragon "#4213-OS", or 4 pole Paragon "#47217-OS" as required.
3. Where required on the Drawings for control of lighting through contactors provide Paragon PET 71 electronic timeclock. Timeclock shall have 7-day carry-over and two (2) single-pole double-throw 15A contacts.

AA. Contactors and Relays:

1. Electrically operated, mechanically or magnetically held as required with coil clearing contacts, no overload, 250 volt or 600 volts A.C. as required. Amperage and number of poles as indicated. Mount contactors on sound absorbing rubber mounts.
2. Relays for control of individual night lighting circuits ASCO Bulletin #1255-166 or General Electric Co. "CR160, Type MB".

BB. Grounding:

1. 480 volt motors or equipment shall have bonded ground jumpers from the feeder conduit to motor frame.
2. Grounding bushings shall be used wherever conduits are grounded.

CC. Lighting Fixtures:

1. Provide complete lighting system, wired, assembled and operable, including lighting equipment and accessories as shown on the drawings, described in the fixture schedules and specified herein. Accessories include canopies, suspension of proper lengths, hickeys, castings, sockets, holders, reflectors, ballasts, diffusing material, louvers, plaster and mounting frames, lamps, recessing boxes, supporting brackets and channels to span structural members. Fixtures shall be factory prewired and preassembled.
2. Catalog numbers are given for the manufacturers' identification. Conform to standards of quality defined by written descriptions and catalog numbers. Fixtures to be UL labeled for location and operating conditions required.
3. Fixtures of same type shall be of one manufacturer and of identical finish and appearance. Where not identified on Drawings, provide same type as indicated in similar locations.
4. For recessed fixtures, provide frame and trim compatible with ceiling type and construction. Refer to ceiling specifications and architectural drawings to determine types.
5. Provide adequate lamp shielding, proper ventilation, and heat dissipation.
6. Secure diffusers to trim by devices not requiring tools for removal, or for relamping.
7. Locate fixture outlets and recessed fixtures by reference to Architectural Drawings, Architectural Reflected Ceiling Plans, and measurement of the building construction. Do not scale the Electrical Drawings.
8. Shop Drawings and Substitutions: Submit Shop Drawings in accordance with the specifications and the requirements of this Section. Shop Drawing, substitutions and lighting fixture substitution sample submittals shall include but not be limited to the following:
   a. For all lighting fixtures and other lighting equipment specified in this section, submit lighting brochure indexed alphabetically in accordance with fixture identification on the Drawings, tabbed for each fixture and clearly identifying catalog numbers for each piece of equipment and all special features.
   b. Submittal of fixtures listed with the manufacturer's name and series or model number shall include the following:
      (1) Current manufacturer's data sheet (copies not acceptable) or the construction drawing for each light fixture type. Duplication of types on a single data sheet or drawing is not acceptable. Data shall include dimensions, weight, ballast characteristics, lens description, louver, diffuser, finish, frame, housing, reflector, recommended lamps.
      (2) Fixture options, finishes, electrical characteristics, lamp type, ballast type and manufacturer, lens thickness/type/ manufacturer.
      (3) If requested by the Architect, a non-returnable sample fixture fitted with appropriate lamp, 120 volt components, and 6 foot grounded power cord and plug.
   c. Substitutions. Submittal of fixtures proposed for substitutions shall include, in addition to all the requirements listed above in paragraph b, the following:

(1) Luminaire photometric test report issued by approved independent testing laboratory. Tests shall have been conducted in accordance with recommended testing procedures of the (IES) Illuminating Engineering Society and include following information.
(a) Candlepower data, presented both graphically and numerically, in 10° increments (0°, 5°, 15°, 25°, etc.). Data shall be developed for both up and down light, normal, parallel, and at 22.5°, 45°, and 67.5° when light output is symmetrical.
(b) Zonal lumens stated numerically at 0°-30°, 0°-40°, 0°-60°, 0°-90°, and where applicable, 90°-120°, 90°-130°, 0°-180°.
(c) Coefficients of utilization in numeric form.
(d) Total luminaire efficiency.
(2) Construction or installation drawings, to scale, illustrating mounting procedures within each ceiling construction type on project when occurring.
(3) A non-returnable sample fixture fitted with appropriate lamp, 120 volt components, and 6 foot grounded power cord with plug.

d. Sample of Finishes. Submit chip samples for all finishes and colors noted on the schedule to be selected by the Architect. Chip shall be minimum 4" x 4" and be a true sample of the finish on fixture material and not merely color. Submittal shall include complete description of the finishing process. Chip samples are required for lighting fixture types:
(1) All exterior lighting fixtures and poles.
(2) All surface mounted interior lighting fixtures.

9. Before ordering the specified light fixtures make available to the Owner, on request, samples for final approval.

10. General Construction:
a. Sheet Metal: Free of tool marks and dents. Finished to eliminate exposed sharp edges with intersections and joints formed true, sufficiently rigid to prevent distortion after assembly.
b. Castings: Free of blemishes, scale and rust, and finished smooth.
c. Aluminum Surfaces, Nonreflecting: Anodized clear and with color as indicated. Castings to be irridited, sandblasted and anodized.
d. Aluminum Reflectors: Treat with alzak process to provide a permanent reflective surface. Extruded reflectors to be unscored, bright dipped and clear anodized.

11. Ballasts:
a. General:
(1) All ballasts for a single type lighting fixture shall be by a single manufacturer to assure consistent and similar light output of that type lighting fixture.
(2) Ballasts for all electric discharge lamps shall be located within same fixture housing unless specified to be remote.
(3) Ballasts shall comply with all applicable UL, CBM, and ANSI standards and shall be UL listed. Ballasts performance may be certified by a nationally recognized and independent testing laboratory with a U.S. government registered certification mark for fluorescent lamp ballasts. Performance certification shall be conducted per ETL procedure B20.2 in accordance with ANSI C82.2 test methods. All interior ballasts shall conform to the State of California Title 24 Energy Standards.
(4) All ballasts shall be high power factor (H.P.F.) 90% minimum. Capacitors in ballasts shall not have PCB's.
(5) All ballasts shall be grounded per NEC Article 410-E.
(6) All fluorescent ballasts utilized on the interior shall be energy saving type unless noted otherwise.
(7) The terms outdoors and exterior when used in this Section shall mean outside of the building or structure and unheated areas within the confines of building or structure.
(8) Operating temperature shall, in general, be as follows:
(a) Normal room ambient, 68°F to 84°F.
(b) Mechanical and boiler room ambient 131°F.
(c) Outdoors 20° F.

b. Fluorescent Ballasts
   (1) Operating Voltages: Ballasts shall operate within the following voltage limits without any deleterious effect.
      (a) Nominal voltage 120 VAC, operating range 108-132 VAC.
      (b) Nominal voltage 277 VAC, operating voltage 249-305 VAC.
   (2) Minimum Starting Temperature for outdoor and indoor ballasts shall be as follows unless otherwise indicated on the Drawings.

Type Lamps	Starting Type Ballast	Starting Temp. Outdoors	Temp. Indoor
Ma Rapid Start	Standard	0° F	50° F

   (3) Protection. Ballasts shall have UL listed Class P to limit ballast case temperature to 90° C maximum with reset.
   (4) Sound Rating:

Type Lamps	Type Ballasts	Indoor Ballast Sound Rating
Ma Rapid Start	Standard	Type A

   (5) Warranty. Fluorescent ballasts shall be warranted against failure due to defects in material and workmanship for a minimum period of three (3) years from date of installation acceptance regardless of the date of manufacture.

c. HID Ballasts
   (1) Operating Characteristics. Ballasts for mercury or metal halide lamps shall be (CW) constant wattage (isolated) type. High pressure sodium lamps ballasts shall be auto-regulator type for 250, 400, and 1000 watt lamps and lag regulating type for 70,100 and 150 watt lamps. All ballasts shall have the following characteristics:
      (a) CW: A ± 13 percent variation in line voltage shall not result in a variation in lamp wattage greater than ± 2 percent.
      (b) All high pressure sodium ballasts shall meet the ANSI Trapezoid limitations of lamp wattage due to ± 10% line voltage.
   (2) Starting Temperature. Ballast starting temperature shall be -20° F.
   (3) Protection. HID ballasts shall be fused with size and type recommended by ballast manufacturer. Reference THE FUSING LIGHTING FIXTURES AND POLES paragraph hereinafter.
   (4) Sound Rating. In the absence of unified standards for sound rating in ballast industry, the requirement of sound level limitation shall be based on quietest model available for type of lamp used. Where available, ballast shall carry a sound rating of A.
   (5) Outdoor Ballasts. Ballast cases and covers shall be weatherproof type to prevent entry of moisture. Where wiring enters ballast provide a permanent watertight seal.
   (6) Warranty. HID ballasts shall be warranted against failure due to defects in material and workmanship for a minimum period of one (1) year from date of installation acceptance regardless of the date of manufacture.

d. Manufacturers:
   (1) Electronic ballasts rapid start and bi-ax lamps shall be type manufactured by Magnetek Triad (Ballaster), Advance Transformer Company or approved equal.
      (a) Ballasts shall operate lamps at a frequency of 20 to 35 KHz with no detectable flicker.
      (b) Ballasts that operate as a parallel circuit shall permit other lamps to maintain full output after failure of companion lamp(s).
      (c) Rapid-Start ballasts shall provide soft/stable start of rapid-start lamps and shall maintain full cathode heat during operation.
      (d) Ballasts shall be of U.S. manufacture and carry a 3-year warranty.

(e) Ballasts shall comply with FCC and NEMA limits governing EMI and RFI and shall not interfere with operation of other normal electrical equipment.
(f) Ballasts shall meet applicable ANSI standards (i.e. harmonic distortion, surge protection, etc.).
(g) Ballasts shall not be affected by lamp failure and shall deliver normal lamp life.
(h) Ballasts shall be marked with the manufacturer's name, part number, supply voltage, power factor, open circuit voltage, current draw for each lamp type and UL listing.

(2) HID ballasts shall be manufactured by General Electric, Universal Manufacturing Co., or Advance Transformer Company.

(3) Non-Electronic fluorescent ballasts.
(a) Ballasts shall be UL Listed, Class P, Sound A rated.
(b) UL Listed when installed in the fixture.
(c) Energy saving type to comply with State of California Title 24 requirements.
(d) Be fully operationally compatible with lamps provided.
(e) Shall be manufactured by Advance Transformer Co., Universal Manufacturing Corp. or General Electric Company.
(f) Carry a 3-year warranty.
(g) All ballasts shall be high power factor (HPF) 90% minimum. Capacitors in ballasts shall not have PCBs.
(h) All ballasts shall be grounded per NEC Article 410-E.
(i) Operating temperature shall, in general, be as follows:
-- Normal room ambient, 68°F to 84°F.
-- Mechanical and boiler room ambient 131°F.
-- Outdoors 0°F.
(j) Operating Voltages: Ballasts shall operate within the following voltage limits without any deleterious effect.
-- Nominal voltage 120 VAC, operating range 110-125 VAC.
-- Nominal voltage 277 VAC, operating voltage 255-289 VAC.
(k) Minimum starting temperature for the outdoor and indoor ballasts shall be as follows unless otherwise indicated on the Drawings:

Type Lamps	Type Ballast	Starting Temp. Outdoors	Starting Temp. Indoor
Ma Instant Start	Slimline	-20°F	50°F
Ma Rapid Start	Standard	-20°F	50°F
Ma Rapid Start	Energy Saving	-------	60°F
Ma Rapid Start	High Output	-20°F	50°F
Ma Rapid Start	Power Groove	-20°F	50°F

12. Fusing Lighting Fixtures and Poles:
a. General:
(1) All HID fixtures shall be fused.
b. Material and Application:
(1) Fuseholder shall be one of the following:
(a) Up to 300 volts, for all interior mounted fixtures provide Bussmann HLR holder (w/6" of #18 solid CU wire)
(b) Up to 600 volts for all outdoor mounted fixtures or fixtures exposed to moisture (or in pole bases) provide fuseholders for 1-1/2" long x 13/32" fuses of correct wire size:
-- Joy X8919 holder (two terminal)
-- Joy X8917 holder (one terminal)
-- Bussmann HEX holder (two terminal)
-- Bussmann HEB holder (one terminal)

(c) When manufacturer's standard design uses other fuseholders such as panel mounted (HPC-D, HPF, HPL-B, etc.), they will be acceptable providing voltage and ampacity for the intended application does not exceed the values of those specified above.

c. Manufacturer. Fuse holders shall be manufactured by Bussmann Division of McGraw Edison or Joy Manufacturing Company (Hiway Lighting Connectors) or approved equal.

13. Fluorescent Fixture Temperature Rating:
    a. Design recessed fixtures to limit ballast case temperature installed in fixtures to 90°C with line voltage at 277 volts plus 5%, room ambient at 25°C plus 5 percent, plenum ambient at 55°C plus 5%, and ceiling material not to exceed R factor of 20.
    b. Certify conformance on submittals.
    c. Conform with Warranty-Guarantee Requirement per Section 01790.
14. Fluorescent Fixture Construction:
    a. Lampholders: Bipin type. Permitting full entry of lamp pins in a vertical plane, after which entry, a 90° rotation shall properly seat the lamp. Corrosion-resistant "edge-wipe" type lamp pin contacts.
    b. Lampholder Fastening: Securely fasten to brackets or socket straps with machine screws in a manner to eliminate excessive flexing under normal lamp pressure. Replaceable without removing fixture from the installation. In fixtures with end plates, backed by fixture housing to prevent twisting. Where sockets cannot be backed up by housing, secure with two screws or bolts.
    c. Housings and Bodies: Fabricated or die-formed, cold-rolled heavy-duty steel welded into a 1-piece assembly using lab seam construction. Breaks, bends, edges, holes, and knockouts accomplished by die-forming and machine operation. Alternately, fabricated of extruded aluminum sections or die-formed from aluminum with sections positively interlocked to provide a rigid unit. A complete die-formed housing of heavy-duty steel will be acceptable providing the unit is ribbed, embossed or paneled for strength.
    d. Provide wiring and ballast compartment accessible from below when fixture is in installed position, with wiring secured to the body of the fixture with the cover removed.
    e. In suspended ceilings, and in addition to seismic suspension, provide four clips attached to fixtures to positively tie fixture to T-bar or ceiling channel suspension. In plaster and drywall ceilings, provide plaster frame and U channel supports.
    f. In fixed ceilings, provide access to fixture outlet box through fixture.
    g. Finish: Finish visible fixture trim in color designated on the Drawings, or baked matte white enamel where not otherwise noted.
    h. Rustproof Metal Parts: Provide enamel finish, baked-on at a minimum temperature of 300°F. Enamel reflective surface to have 87 percent reflectivity, minimum.
    i. Louvers: Parabolic louver blades 3" deep; semi-specular anodized aluminum reflector sheet; low iridescent, contoured to assure lamp shielding, lamp image, and white interior surfaces. Minimum 30° shielding.
    j. Lenses: Flat lens designed to direct the light down and present low surface brightness within normal viewing angles; high molecular weight virgin acrylic plastic having maximum melt flow rate of 2.2 grams/10 minutes per ASTM D1238 Condition 1 and minimum temperature flow of 315°F per ASTM D569; smooth on one side, and uniform pattern of male cones or hexagonal prisms on the other. Special types where noted on fixture schedule. Prismatic lenses shall be manufactured by KSH Inc. as noted above. Prismatic lenses by J.W. Carroll & Sons, or PSI West meeting all of the requirements specified will be considered equal.
    k. Doors: Provide minimum trim separable hinged door with mitered corners, secured in place by inconspicuous spring loaded, visible, finger operated catches, removable without tools, but hinged to preclude accidental dislodgement in the open position. Incorporate light trap between door and fixture. Retain lens or louver firmly in door with clips or clamping frame, but allowing for lens replacement without special tools.
    l. Fixture Wiring: Wire with 600 volts, 105 C rated, thermoplastic or asbestos insulation, No. 14 AWG minimum size. Interconnect between sockets and ballasts, and provide twelve inch minimum length pigtails. Provide two wire pigtail for single circuit connection, four wire for

two circuit connection. Where the fixture is served from two sources, barrier wiring from emergency source and provide inside notation indicating separate source.

m. Modular Wiring: Where modular wiring systems are used in conjunction with the lighting fixtures, manufacturer of light fixture shall provide UL listed fixture for use with modular or manufactured wiring systems.

n. Fixture Connection: Connect to the fixture outlet with six foot length of flex and conductor insulated for rated fixture operating temperature if modular wiring system cannot be used.

o. General: All sagging, cracked, dented, or otherwise damaged lenses or louvers in lighting fixtures shall be replaced. The replacements shall be new lenses or louvers of the same type and color as those damaged.

p. Labeling: Provide specific UL label for use and mounting.

Label	Use
IC	Insulated ceilings
Non IC (w/Thermal Overload)	Fixed ceiling
SC	Suspended accessible ceiling
Damp Location	Exterior protected location
Wet Location	Exterior exposed locations

15. Incandescent Fixtures:

a. Medium base sockets below 300 watts and mogul base for 300 watts and larger unless noted otherwise.

b. For recessed fixtures, provide mounting frame with an attached prewired junction box, rated for through wiring with 60°C conductors, designed to install without installing trim, diffusers, or lens. Verify suitability of attached junction boxes for number of conductors indicated on Drawings, and provide additional boxes where attached junction box capacity is exceeded.

c. Provide specific UL label for use and mounting.

Label	Use
IC	Insulated ceilings
Non IC (w/Thermal Overload)	Fixed ceiling
SC	Suspended accessible ceiling
Damp Location	Exterior protected location
Wet Location	Exterior exposed location

d. Fasten fixture sockets and reflectors securely to body to prevent rotation or rocking during relamping.

e. Fasten or hinge trims and lenses to the fixture body so that no part of the fixture must be held during the relamping procedure. Securely retain lenses in lens door so that dropping of door cannot dislodge lens.

f. Glass lenses or diffusers shall be free of spherical or chromatic imperfections, with thermal characteristics of "Pyrex".

g. Recessed incandescent fixtures in the same area shall be supplied by the same manufacturer to assure matching of cone colors and trim pieces.

h. Wall Recessed or Surface Mounted: (Similar for wall or surface mounted compact fluorescent).

(1) Provide adequate support for lighting fixture by rigidly supporting the fixture housing and outlet box.

(2) Coverplates, trim pieces or canopies shall meet flush with the wall for recessed units and tight to the fixture housing for surface mounted units.

16. High Intensity Discharge Fixtures:

a. Provide porcelain screw type mogul sockets UL listed at 600 volts, 1500 watts, and securely fastened to fixture body to prevent twisting or rocking of socket when lamping or relamping. For pendant units, provide balanced construction for use on swivel hanger.

b. Bracket Mounted:
   (1) All bracket mounted fixtures shall be specifically designed for this type installation.
   (2) Mounting hardware shall be completely tight.
c. Ceiling Recessed and Surface Mounted:
   (1) Provide adequate support for lighting fixtures by rigidly supporting the recessed outlet box in finished areas or surface mounted box in unfinished areas.
   (2) Coverplates or canopies shall be screwed tight to the box. Coverplates or canopies on recessed boxes shall meet flush with the wall.
d. Wall Surface Mounted: Provide adequate support for lighting fixture by rigidly supporting the recessed outlet box in finished areas or surface mounted box in unfinished areas.
e. General: Provide ballast compatible with specified lamps, per HID Ballasts specification, and so certify.

17. High Pressure Sodium Vapor Additional Requirements:
a. Ballast shall operate with the lamp in open or short circuit condition for six months without significant loss of ballast life.
b. 2% maximum wattage variation from lamp watts at rated voltage.
c. 2% maximum wattage variation at ±10% voltage variance.
d. Power factor 85% minimum ±10% voltage variation through life.
e. Ballast, including starting aid, to protect itself against normal lamp failure modes.

18. Parking Lot, Floodlighting and Decorative Standards. In Addition to Specific Fixture Specifications, provide:
a. Complete installation including poles, anchor bolts, luminaires, lamps, ballasts, wiring as detailed and/or specified, mounted on reinforced concrete bases.
b. UL wet location label on fixtures on exterior or in wet locations.
c. Material and Application:
   (1) Pole Mounted Fixtures:
      (a) Housings: Outdoor fixture housings on poles shall be sealed, weatherproof construction to protect the optical and electrical components from exposure to water and insects.
      (b) Labels: Outdoor fixtures on poles shall have UL label marked "Suitable for Wet Locations".
      (c) Frames: Access covers or lens frames shall be hinged on all fixtures. Elements attached to covers or lens frames shall not slip or become loose upon opening of frame.
      (d) Brackets: Where slipfitter or tenon mounting brackets are required for single or multiple fixtures, they shall be designed to be attached to the type and size pole and fixture housing provided to obtain close fit and a quality installation.
      (e) Accessories: Fixture manufacturer shall provide all attachments and hardware required to securely fasten the fixture to the pole.
      (f) Tamperproof Hardware: Exposed screws on fixtures shall be tamperproof type.
      (g) Gasketing: Shall be appropriately placed, and bonded to seal out water and insects. Gasket material shall withstand full range of operating temperatures without leaking, cracking or loosening. Gasket material shall be impervious to water and be made from neoprene, silicone or similar material. Gaskets shall be one continuous length unless otherwise noted.
      (h) Ballasts: Shall be easily removable.
      (i) Lens, Reflector, and Lamp: Fixture lens shall be sealed with watertight and bugtight gasket. Reflector shall be polished aluminum and be free of dents that interfere with efficiency. Reflector shall be adjustable where shown. Lamps shall be easily accessible for replacement and be the correct type and wattage for which the fixture was designed.
      (j) Floodlights: Floodlights with yokes or threaded stems shall be adjustable and have vertical aiming scales and repositioning stop.

(2) Wall or Bracket Mounted Fixtures:
(a) Wall and bracket mounted fixtures are defined as exterior fixtures mounted on the building wall and are located with direct exposure to rain, sleet and snow.
(b) Fixtures shall have UL label marked "Suitable for Wet Locations".
(c) All brackets shall be designed to be attached to the type fixture used and the type wall or surface that they are to be fastened.
(3) Recessed, Surface, or Pendant Mounted Fixtures:
(a) Recessed, surface, or pendant mounted fixtures are defined as exterior fixtures mounted in or on the building overhang, canopy or covered walkway and are located clear of direct exposure to rain.
(b) Fixtures shall have UL label marked "Suitable for Damp Locations".
(c) Fixtures shall have weatherproof gasketing when available.
(d) Recessed mounting frames shall be designed to match the type surface in which the fixture is to be installed.
(4) Landscape Lighting Fixtures:
(a) Landscape lighting fixtures shall be mounted above or on grade to provide low level lighting for paths or walks, accent lighting, or security lighting.
(b) Fixtures shall be provided with UL label marked "Suitable for Wet Locations".

d. Manufacturer: Manufacturer of outdoor lighting fixtures shall be as shown on the Drawings and the Lighting Fixture Schedule.

DD. Metal Lighting Poles:

1. General:
a. Furnish and install poles for exterior lighting fixtures as indicated on the Drawings and as specified herein.
b. Pole manufacturer shall provide:
(1) Installation and handling instructions.
(2) Anchor bolt template.
(3) Anchor bolts, nuts and washers.
(4) Touch-up finishing kit.

2. Material and Application:
a. Poles shall be designed for winds up to 100mph plus a 1.3 gust factor; while supporting the lighting fixtures with projected areas of the lighting fixture installed.
b. Length of pole shall be as noted on the Drawings.
c. Pole shall be straight (non-tapered) construction with handhole at base.
d. Construction shall be steel or aluminum as shown. Each pole shall have interior grounding lug for fastening a No.6 AWG copper grounding wire.
e. Poletop tenon shall match the fixture or mounting bracket slipfitter.
f. Pole manufacturer shall furnish template for placing anchor bolts and conduits.
g. Hot-rolled carbon steel anchor bolts with a minimum yield strength of 50,000 psi shall be provided with each pole. Galvanized or plated bolts shall be sized and furnished by the pole manufacturer. Bolts shall have an "L" bend on one end for placement in concrete base and threads of adequate length on other end for bolting pole base in place.
h. Each anchor bolt shall be provided with a leveling nut, one hold down nut and two washers by the pole manufacturer. Nuts and washers shall be galvanized or plated. Leveling shims in lieu of leveling nuts are not acceptable.
i. A full base cover shall be provided to cover the anchor bolts and pole baseplate. Base cover shall have provision for preventing vertical uplift of the cover after installation.
j. Accessories shall include but not be limited to the following:
(1) Mounting brackets
(2) Arm connections and arms
(3) Poletop cap
(4) Pole base cover

k. Finish:
   (1) Poles specified with finish coat of paint shall be carefully handled to avoid damaging the surface. Protective wrapping shall be removed as soon as possible after unloading.
   (2) Poles with the finish coat scraped or scratched shall be repaired as soon as possible to prevent rusting. Scraped or scratched areas shall be sanded, wiped clean and a new prime coat and finish coat applied. (Color per Architect's requirements.)

EE. Concrete Bases for Lighting Poles:
1. General
   a. Work specified herein shall consist of furnishing all labor, equipment and services necessary for and reasonably incidental to construction of drilled piers.
   b. Disposal of surplus material from holes shall be removed from site.
   c. Contractor shall familiarize himself with site conditions as represented by boring logs.
   d. Contractor shall supply wind load and footing design structural calculations. Design shall be by a licensed California structural engineer.
2. Material and Applications
   a. Concrete shall have 28-day strength of at least 3000 psi and maximum 4" slump. Concrete shall not be used which has had water added to mix for more than one hour before placing. At least four concrete test cylinder specimens shall be made from each day's pour.
   b. Reinforcing steel bars: ASTM A615, Grade 60.
   c. All anchor bolts, nuts, washers, and templates shall be supplied by the pole manufacturer.

FF. Lighting Fixture Description: Refer to schedule on Drawings, as follows, and to requirements in other Paragraphs herein.

GG. Lamps:
1. General: Unless specified otherwise herein, furnish and install a lamp for each fixture of type and wattage indicated on Drawings. Replace all burned-out lamps or ballasts at the completion of the Work just prior to Architect's final punchlist.
2. Fluorescent lamps: Compatible with the specified ballast and fixtures. 3500°K unless otherwise noted. Compact fluorescent shall be wattage as listed on drawing 3500°K lamps.
3. Incandescent lamps: Inside frosted or as recommended by fixture manufacturer. Provide 130 volt rating, unless otherwise noted.
4. Metal Halide: Phosphor coated unless otherwise noted, universal burning type, with compatible ballasts in enclosed fixtures. Breaking of outer glass to disconnect supply to arc tube.

Watt	Base	Initial Lumens	Life-Hours	Comment
100	ED-17	8,500	10,000	Enclosed Fixture
175	BT 28	14,000	7,500	Enclosed Fixture
250	BT 28	20,500	10,000	Enclosed Fixture
400	ED-18	24,000	50,000	By Venture or Phillips

5. High Pressure Sodium: Diffuse coated, unless otherwise noted, universal burning type, used with compatible ballasts.

Watt	Base	Initial Lumens	Life-Hours
50	BT 25	3,800	24,000
70	BT 25	5,860	24,000
100	BT 25	8,800	24,000
150	ED 25	15,000	24,000
250	BT 28	26,000	24,000

6. Manufacturer: All lamps shall be manufactured by the same manufacturer, Sylvania Industrial/ Commercial Lighting a division of GTE Products Corp., General Electric Co. or approved equal.

HH. General Purpose Receptacles:

1. Shall be specification grade, 2P-3W, with provisions for back-wiring from eight separate wiring openings with screw activated clamp type terminals and side wiring with captively held binding screws.
2. Receptacle cover shall be high-impact, chemical resistant nylon and housing shall be high-impact, chemical resistant ABS/PVC or equal. Mounting strap shall be wrap-around design and grounding contact must be heavy-duty type.
3. Listed by Underwriters' Laboratories Inc. and verified as meeting Fed Spec W-C-596F.
4. Receptacles shall be General Electric or approved equal or Hubbell, Bryant, or Pass & Seymour.
5. Duplex Receptacles:
   GE5262-7 15A-125V White
   GE5362-7 20A-125V White or color as approved by Architect
6. Single Receptacles:
   GE5261-7 15A-125V White
   GE5361-7 20A-125V White or color as approved by Architect
7. Isolated Ground Duplex Receptacles:
   GE5262-IG 15A-125V Orange
   GE5362-IG 20A-125V Orange
8. GE color suffix (-1) Brown, (-2) Ivory, (-7) White, (- 8) Red, (-9) Gray.
9. Receptacles shall be installed with the "U" grounding contact at the top. Where receptacles are mounted horizontally they shall be installed with the neutral contact at the top.
10. Special receptacles as indicated on Drawings.
11. All receptacles shall be submitted for Shop Drawing review and color approval to the Architect.

II. Toggle Switches:

1. Quiet AC-type, specification grade with provisions for backwiring with screw actuated clamp type terminals, side-wiring with adaptively-held binding screws and separate screw terminal for the grounding wire; color coded for current rating, and certified by UL as meeting Fed Spec W-S-896E.
2. Switches shall be General Electric or approved equal by Hubbell, Bryant, or Pass & Seymour.

	20 AMP 120-277V AC	30 AMP 120-277V AC
White Toggle Switch	2HP -240V	2HP-240V
Single Pole	GE5951-7G	GE5991-7G
Double Pole	GE5952-7G	GE5992-7G
Three-Way	GE5953-7G	GE5993-7G
Four-Way	GE5954-7G	GE5994-7G

3. Special switches as indicated on Drawings.

Locking	GE5951-OLG	GE5991-OLG
Pilot Light (Red Toggle)	SP121-8G	SP131-8G
Locator Light	SL122-2G	SL132-8G
Momentary (SPDT) Maintained (SPDT Center Off)		

4. Catalog Number Toggles Color Suffix: (-1G) Brown, (-2G) Ivory, (-3G) Black, (-7G) White, (-8G) Red, (-9G) Gray, (-OLG) Locking.

JJ. Plates:

1. All switches, receptacles, telephone, CRT and blank outlets shall be of white finish unless noted otherwise. General Electric, Hubbell, Bryant, or Pass & Seymour.

2. Outlets on exposed conduit runs shall have cast conduit fitting device covers.
3. Plates requiring engraved lettering shall be as:
   a. Contactor control switches.
   b. Key operated switches.
   c. Switches with pilot lights.
   d. Motor, heating and ventilating control switches.
   e. Switches where outlets or switch equipment are not visible from switch location.

KK. Mounting Facilities: Provide mounting facilities required for properly securing of the hanging fixtures, equipment, and outlets. Provide sleeves, inserts, expansion joints, and all components as required.

LL. Dimmers (Individual):
1. Performance: All devices shall be capable of operating at the rated capacity without adversely affecting design lifetime.
   a. All devices shall mount individually in a single gang U.S. switchbox, and shall be gangable without removing side sections or derating capacity.
   b. Devices shall operate in an ambient temperature range of 0°C (32°F) to 40°C (104°F).
   c. All dimmers and switches shall include airgap switch which is accessible without removing the faceplate. The airgap switch shall be capable of meeting all applicable requirements of UL 20 for airgap switches in incandescent dimmers.
   d. All dimmers and switches shall provide power-failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption. Restoration to another default level is not acceptable, unless specifically noted elsewhere.
   e. Dimmers and switches shall not be susceptible to damage or loss of memory due to static discharge.
   f. Dimmers and switches shall meet ANSI/IEEE Std. C62.41-1980, tested to withstand voltage surges of up to 6000V and current surges of up to 200A without damage.
   g. Dimmers and switches shall meet the UL 20 limited short circuit test requirement for snap switches.
2. Dimmer Controls:
   a. Dimmer control shall be linear slide.
   b. Linear slide dimmer shall provide intensity and on/off control with movement of slider. This applies to single pole and 2-location dimmers.
   c. Preset dimmers shall incorporate separate control of intensity and on/off.
      (1) Provide additional auxiliary controls shown on the Drawings to turn lights on to levels set at preset control, and off.
   d. Dimmers shall be voltage regulated so that a ±10% variation in line voltage shall cause no more than a ±5% variation in load voltage when the dimmer is operating at 40V (5% light output).
   e. All dimmers shall provide a smooth and continuous Square Law Dimming curve.
   f. Dimmers shall use an LC filtering network to minimize interference with properly installed radio, audio, and video equipment.
   g. Dimmer control slider shall be captured.
   h. Incandescent: All dimmers shall meet UL 20 and be appropriately marked.
   i. Electronic (Solid-State) Low Voltage Transformer/Sol-Lo:
      (1) Dimmers shall contain circuitry specifically designed to control the input of electronic (solid-state) low voltage transformers. Dimmers using standard phase control will not be acceptable.
      (2) Dimmers shall not adversely affect sound rating of electronic transformer. In addition, no flicker or interaction shall occur at any point in the dimming range.
      (3) Dimmers shall have overload protection that reduces the power output when dimmer capacity is exceeded.

j. Magnetic Low Voltage Transformer:
(1) Dimmers shall have circuitry specifically designed to control and provide symmetrical AC waveform to the input of magnetic low voltage transformers.
(2) Dimmers shall not cause a magnetic low voltage transformer to operate above the transformer's rated operating current and temperature.

3. Switches (To Match Dimmers in Common Gangs):
a. All switches shall be available in single pole, 3-Way, and 4-Way configurations.
b. Switch rating shall be 20A for either 120 or 277VAC, tungsten or inductive loads.
c. Electronic switch rating shall be 2000W, 120VAC for incandescent, electronic low voltage transformer, magnetic low voltage transformer, and fluorescent loads.

4. Faceplates:
a. Contractor shall be responsible for mounting devices on a flat wall. A flat wall is a wall with less than 1/8" depth deviation per every 3 feet.
b. Multi-gang faceplate shall include mounting frame for proper device alignment and faceplate attachment.

c. Plastic: (Use stainless steel where stainless steel coverplates are used on other devices.)
(1) Unless otherwise specified, faceplates shall be constructed of high impact, scratch-resistant ABS plastic. Standard color shall be white. Color shall be as specified on Drawings or Control Station Detail.
(2) Faceplate shall snap on to device with no visible means of attachment.
(3) Heat fins shall not be visible on front of device.
(4) At locations with multiple devices, provide one seamless multi-gang faceplate. The Contractor is responsible for coordination of proper switchbox size and faceplate type.

5. Quality Control:
a. All components used in devices shall be inspected following U.S. military standard 105D or equivalent.
b. All devices shall be fully tested for proper operation prior to shipment from the factory.

6. Installation: Devices shall be installed utilizing manufacturer's recommended application, wiring, and installation instructions.
7. Warranty: All devices shall be covered by a minimum one year warranty from time of purchase.
8. Manufacturers: Design is based on Lutron Nova T Star series dimmers.

MM. Motion Sensors (Occupancy Sensors):
1. General:
a. Sensors shall be self-contained, ultrasonic motion detectors providing volumetric coverage without gaps within the detection area.
b. Sensors shall have rugged solid-state design, designed specifically for energy conservation.
c. Operating frequency shall be crystal controlled to within ±0.01%; ultrasonic transducers must be protected from damage.
d. Sensors shall be available with different operating frequencies to allow individual control of adjacent areas.
e. User adjustable controls shall be provided for "sensitivity" and "time delay".
f. Coverage shall remain constant after sensitivity control has been set.
g. No reduction in coverage shall occur when air-conditioning is in operation.
h. Sensors shall be able to be wired in parallel to allow coverage of large areas.
i. Ceiling mounted sensors shall operate on 15 VDC as supplied by Model 13-011 Switchpack.
j. Sensors shall be suitable for Class 2 wiring.
k. An easily visible indicator light shall be provided to verify that motion is being detected.
l. Sensors shall be designed, specifically, for size and use of area in which they will be used.
m. All ceiling mounted sensors shall have pigtailed teflon connectors for easy installation.
n. Except when actually switching the load, system operation shall be silent.
o. All sensor locations shall be checked by sensor manufacturer to ensure complete coverage. Sensors shall be installed per the manufacturer's submittal. For sensors other than the design basis, the Contractor shall have each application specifically verified for coverage.

p. All sensors and associated switchpacks shall be warranted for a minimum of three years.

2. Switchpack:
   a. The switchpack shall provide 15 VDC power to sensors (two minimum) and perform relay switching of load.
   b. Relay contacts shall have ratings of:
      10A - 120 VAC Tungsten
      20A - 120 VAC Ballast
      20A - 277 VAC Ballast
   c. Relay contacts shall be isolated.
   d. The switchpack shall mount to the coverplate of a standard 4" junction box, with or without an extension ring. Mounting requires only a single locknut, which shall be supplied.
   e. The switchpack shall be operable on either 120 or 277 VAC circuits.
   f. The switchpack shall be U.L. listed.
   g. The Contractor shall provide supplementary relays as necessary to control loads as shown on the Drawings.
3. Wall Switch:
   a. The wall switch shall be designed to cover areas up to 300 square feet in one direction.
   b. The wall switch shall detect the types of motion common in offices, small conference rooms, lavatories, copy rooms and storage rooms.
   c. The unit shall require a pushbutton to be pressed to turn light on. Lights may also be turned off with the same pushbutton, or lights shall automatically be turned off after preset period of time elapses.
   d. There shall be 10-second "grace" period after unit turns lights off (because of lack of motion) during which a new motion will automatically turn lights on without the pushbutton having to be pressed.
   e. Sensitivity and time-on after activation shall be user adjustable through concealed controls to minimize tampering. Time-on shall be adjustable between 30 seconds and 12 minutes.
   f. Override capability, for use in emergency or during lamp changes, shall be provided by a three-position switch which allows selection of positive on, off, and automatic operation.
   g. Wall switch shall incorporate a self-resetting thermal cutout to protect the unit from excessive overloads or overheating.
   h. The wall switch is easily installed in any standard single or two gang junction box.
   i. Units shall be UL listed for 120 VAC circuits; and/or 277 VAC circuits.
4. General Purpose Room Sensors:
   a. These sensor units shall be available with either single direction coverage pattern or two-way pattern.
   b. Sensors shall be specifically designed to detect types of motion found in offices, classrooms, conference rooms, etc.
   c. One-way pattern sensors shall cover 900 square feet of 1/2 step motion and 670 square feet of working-at-desk motion.
   d. Two-way pattern sensors shall cover 1,800 square feet of 1/2 step motion and 1,344 square feet of working-at-desk motion.
   e. Sensors shall provide sufficient switching capability to activate up to ten switchpacks.
   f. Sensors shall contain timing circuitry to provide user adjustable "time to light off" delay of 30 seconds to 12 minutes.
   g. User controls shall be recessed to limit tampering.
   h. Sensors shall surface mount to ceiling tiles through single 3/4" hold with provided hardware.
   i. A manual override switch in the sensor shall allow the load to be turned on without tools in event of sensor failure.
   j. Sensors shall be replaceable, in the event of failure, without disturbing hard-wiring.
   k. All features shall apply as in Motion Sensors (Occupancy Sensors).
5. Corridor and Warehouse Sensors:
   a. These sensors shall be specifically designed to respond to walking motion.
   b. Sensors shall detect motion in a corridor 14' wide and 80' long with one sensor if mounted 10' above the floor.

c. Sensors shall detect motion in a warehouse aisle 10' wide and 60' long (walking motion) or 100' long (forklift motion) when mounted 22 feet above floor.
d. Sensors shall have sufficient switching capability to activate up to ten Model 13-011 Switchpacks.
e. Sensors shall contain timing circuitry to provide user adjustable "time to light off" delay of 30 seconds to 12 minutes.
f. A manual override switch in the sensor shall allow the load to be turned on without tools in event of sensor failure.
g. Sensors shall be replaceable, in the event of failure, without disturbing hard-wiring.
h. Sensors shall surface mount to ceiling tiles through single 3/4" hold with provided hardware.
i. All features shall apply as in Motion Sensors (Occupancy Sensors).

6. Manufacturers:
   a. All motion sensors and switchpacks shall be by one manufacturer.
   b. Acceptable manufacturers are Light-O-Matic by Novitas, Inc., Lithonia, or approved equal.
   c. Design is based upon Light-O-Matic sensors.

2.02 DEDUCTIVE ALTERNATES: Refer to Section 01230-Alternates for basic requirements. As a deductive alternate to the specified products, the following items shall be bid. It shall be noted that none of the below items are pre-approved for installation and each item shall be bid separately from base bid and submitted for review by the Architect and Owner. Base bids must be per Drawings and Project Manual.

A. Pullout "T-Type" Fuses: In lieu of "quick make/quick break" fused switches in multimeter applications only, pullout T-type fuses may be bid as a deductive alternate. Use of T-type fuses shall be restricted to maximum ampacity of 200A and shall be of the C.L.F. type to match AIC ratings and current limitation of the specified fuses.

B. Conduit Couplings: Listed setscrew fittings may be bid as a deductive alternate to the compression type fittings (for indoor applications only) on conduits 2" diameter and larger.

C. Metal Clad Cable: Type MC cable may be bid as a deductive alternate in lieu of EMT or flexible metal conduit and wire in dry locations where acceptable to state and local code authorities and the NEC. Bid submittal shall include cutsheets of cable and cutting tools for review. Manufacturer approved rotary cutting tools, and insulated solid copper grounding wire shall be used.

D. Bends and Risers: Schedule 80 type rigid non-metallic conduit may be bid as an alternate to the rigid galvanized steel where encased in concrete for risers and bends. PVC conduit must be installed per all State and local requirements.

E. Concrete Encasement: Provide an itemized deductive alternate for the deletion of concrete encasement (except at risers and bends) for all encasement required by this Section. Encasement required by utility companies shall not be deleted.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Location and verification of dimensions: Scaled and figure dimensions are approximate and are given for estimating purposes only. Before proceeding with work, check and verify dimensions and sizes and assume responsibility for fitting of all materials and equipment to other parts of equipment and structure. Where apparatus and equipment have been indicated on Drawings, dimensions have been taken from typical equipment of the class indicated. Check the Drawings to see that equipment to be installed will fit into the spaces provided.
B. Install materials and equipment in accordance with each manufacturer's recommendations, instructions, industry standards.

C. Trench and Backfill: Provide trenching, concrete encasement of conduit, backfilling and compaction for underground high voltage system.

D. Conduit:
   1. Rigid Conduit: Shall be used when installed in concrete slabs, encased in concrete below slabs, in concrete or masonry walls, exposed on building exterior or exposed on interior walls below 4'-0" above floor, and where required by Code.
   2. Rigid conduit in concrete in contact with earth, except below slab, shall be encased 3" on all sides with red mixed concrete envelope. Concrete mix shall be 5.5 sack, using pea gravel as aggregate.
   3. Protection: Wrap runs underground with Hunt's "Process No. 3" or Scotch "No. 50 tape", applied half-lapped.
   4. EMT:
      a. Use only for concealed interior runs or exposed interior runs 4'-0" above floor.
      b. EMT may be used on roofs under the roofing and where protected by the adjacent rigid roof insulation.
      c. EMT shall not be cast in concrete or installed in masonry walls.
   5. Flexible Conduit: Use in movable partitions, where indicated on Drawings and in other locations due to structural conditions as permitted by Code and with review of Architect.
   6. No conduit and fittings shall be used without prior review.
   7. Seal-tite flexible conduit shall be used for all final connections to motors and in wet, damp or outdoor areas where Drawings indicate use of flexible conduit.
   8. Terminate conduit runs to rotating, adjustable, or movable equipment with flexible connections.
   9. Install flexible isolating connections in the conduit runs between the building structure and the air conditioning equipment, transformers or other equipment transmitting vibration or noise.
   10. Do not use threadless conduit couplings for rigid conduit except for connections requiring union.
   11. Rigid conduit shall be terminated with metallic bushings.
   12. Install three 3/4 in. empty conduits from each flush mounted panelboard to the accessible above ceiling space where conditions occur. Cap conduit with standard galvanized pipe caps.
   13. Mark underground conduit stubs from building with stainless steel plate located +12 in. above the stubouts on exterior wall of building and engraved to indicate size and direction of stubs. Conduit stubs terminating more than 20 feet from building shall have installed, over end of the stub, 6 x 12 inch deep concrete block, flush with finished grade elsewhere. Provide a 3 x 3 inch brass plate, engraved "ELECT", secured to block with brass dowels.
   14. Conduit shall not be embedded in a concrete slab less than 4 in. thick and conduit 1-1/4 in. and larger shall not be installed in concrete slab. Install conduit embedded in concrete slabs not on grade between reinforcing bars and bottom of slab. For slabs on grade, install conduit below slab, as specified.
   15. Non-metallic conduit: Shall be installed underground and in duct banks. Bends and risers shall be schedule 80, concrete encased. Risers shall terminate at the panels and pullboxes with double locknuts and insulated grounding bushing. Bare copper ground wire shall be installed in conduit runs between panels and pullboxes and connected to ground bushing at each end. Ground wire shall be code sized or as indicated on Drawings. Non-metallic conduit shall not be installed in concrete slabs or panels.
   16. Non-metallic conduit in duct banks shall be installed as described in Concrete Encasement.
   17. Provide secure mounting facilities for conduits. Do not use wire or plumbers tape for hanging of suspended conduit. Conduits shall not be secured to suspended ceiling hanger wires or suspended ceiling structure.
   18. Provide junction or pullboxes where required for pulling conductors due to excessive numbers of bends or lengths of conduit runs. Provide separation on voltages for all enclosures. All boxes shall be code sized.
   19. Provide expansion couplings wherever conduits cross expansion or seismic joints or for continuous straight runs in excess of 100 feet except if embedded in concrete. Expansion fittings shall have bonding jumper or be of grounding type.
   20. Re-route conduit where necessary to clear structural and mechanical obstructions.
   21. Bury underground conduit except under buildings to depth of not less than 24 inches below finish grade. Bury runs smaller than 1-1/4" to minimum depth of 6 inches under floor slabs and provide

3 inches concrete encasement. For conduit 1-1/2" and larger, trench sufficiently under floor slabs to provide a minimum buried depth of 36 inches below finish grade. Minimum depths are to top of concrete envelopes.

22. Install long radius bends in underground service conduits and in other long underground runs in excess of 100 feet. Do not flatten or kink bends.
23. Run conduits at right angles or parallel to structural members, walls, floor, and ceiling. Secure the conduits 1-inch and smaller with one hole malleable iron straps. Secure conduits 1-1/4 inch and larger with conduit hangers or 2-hole galvanized straps. Support suspended conduits with conduit hangers and 1/4in. hanger-rod. Rack mount or suspend multiple conduit runs on trapeze hangers with 3/8in. rods.
24. Conduits installed in concrete, wet locations, exposed to the weather, or underground shall have threads filled with red lead and oil before screwing into couplings and threaded fittings.
25. Run conduits in spaces above suspended ceilings parallel to walls and floors.
26. Coordinate conduit runs in roof insulation and for securing of conduit runs above finished roof.
27. Where more than two conduits are installed in one common concrete envelope, separate conduits with conduit spacers.
28. Conceal conduit above ceiling, or in walls, unless otherwise noted.
29. A separate conduit shall be installed for each homerun indicated on the Drawings.
30. Paint fire alarm conduits with a 1-inch wide red band every 5 feet of run.
31. PVC jacketed rigid steel conduit where used in soil below building. Wrap all joints with 4 layers of 10 mil PVC tape. All conduit and fillings which have damaged PVC coating shall be replaced at Contractor's expense.
32. Provide a green insulated ground conductor of size as required by code or parity size as noted in all flexible and PVC conduit runs and in metallic conduit where noted.
33. Do not strap or fasten rigid conduit to mechanical equipment, or to equipment subject to vibration or mounted on shock absorbing bases.
34. Do not secure conduits which are installed above dry type suspended ceilings to ceiling support wires. Support such conduit independent of ceiling suspension systems.
35. Support conduit to structure above suspended ceiling 8" minimum above ceiling to allow removal of ceiling tile. Do not support from T-bars or T-bar hanger wires. Maintain five inch clearance above recessed light fixtures.
36. Support conduits adjacent to walls with preformed channels.
37. Provide plated or galvanized hangers, rods, channels and metallic support and fastening material.
38. Conduit shall not be run closer than 12 inches to any hot water pipe, steam pipe, heater flue, or vent. Maintain minimum 6 inches clearance between conduit and piping.
39. Conduits in furred spaces shall be routed to clear access openings.
40. Upon completing the installation of any run of conduit, the runs shall be tested to see they are free from all obstructions and have a smooth interior. Install pullropes ready to pull circuit conductors.
41. Seal:
    a. Conduits terminating where termination is subject to moisture or where conduit penetrates exterior wall or roof shall be sealed.
    b. Seal conduit from exterior outlets at first interior junction to prevent moisture from entering the building through the conduit.
    c. Seal all conduit to sump pump motors and control panel.
    d. Seal all conduit that passes through the following areas:
        (1) As indicated on the Drawings.
        (2) Classified (hazardous) area.
        (3) Refrigerated area.
        (4) Temperature control room such as cold room or warm room.
    e. Seal material shall be Johns-Manville "Dux Seal", Minnesota Mining and Manufacturing Co. "Scotchfil", or equal.
42. Empty Conduit:
    a. Provide a nylon or a 3/32-inch O.D. polyethylene rope, rated at 200 pounds tensile strength, in all conduits more than 5 feet in length left empty for future use. Not less than 3' of rope shall be left at each end of the conduit.

b. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit and the location of the other end.
c. Cap the open ends of conduits with approved manufactured conduit seals until ready to pull in conductors.
d. Duct banks shall have a continuous slope downward toward the manholes and away from building with pitch of 4 inches in 100 feet minimum. Changes in direction of runs exceeding 10 degrees total, either vertical or horizontal, shall be accomplished with long sweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at ends of short runs of 100 feet or less, and then only at or close to the end of a run.

E. Installation of 600 volt conductors:
1. Conductors shall be continuous between outlets or junction boxes and no splices shall be made except in outlet boxes, pullboxes, panelboard gutters or handholes. Feeders shall not be spliced in pullboxes.
2. Joints, splices, and taps #10 and smaller (including fixture pigtails) shall be connected with "Ideal" wire nuts.
3. Oil or grease shall not be used when pulling conductors. Use acceptable cable lubricants only. Conductors shall not contact earth or be laid out on concrete slabs while being installed.
4. Train and lace conductors neatly in panels, cabinets and equipment.
5. Tighten pressure type lugs on panels and equipment, and re-tighten 24 hours later.
6. Tagging of conductors:
a. Tag branch circuits in panelboards, in gutters, and in junction boxes where unused circuits terminate for purpose of identifying various circuits.
b. Tag feeders and mains in switchboards.
c. Tag with adhesive type marker manufactured by "Brady", distributed by Graybar Electric Co.
7. Install #12 galvanized steel pull wire in empty conduits.
8. Separate conductors of different voltages in independent raceways and enclosures.

F. Flashing: Fasten to roof and flash conduits passing through roof and exterior walls in manner approved by the Architect.

G. Pullboxes:
1. Exercise care in locating underground pullboxes to avoid installation in drain water flow areas.
2. General purpose sheet steel pullboxes shall be installed only in dry protected locations and shall have removable screw covers.

H. Junction Boxes:
1. Outlet boxes shall be mounted at vertical center of block where mounted in masonry walls.
2. Outlet boxes shall be securely fastened to structure.

I. Heating and Ventilating, Air Conditioning, and Plumbing Electrical Work:
1. Outlet boxes shall be mounted at vertical center of block where mounted in masonry walls.
2. Outlet boxes shall be securely fastened to structure.
3. Review mechanical plans for all control wiring, shutoffs, duct detector, and all other electrical coordination requirements.

J. Rough-in locations for fixtures and equipment shall be determined from the unit itself or from approved Shop Drawings.

K. Provide all necessary anchoring devices and supports.
1. Use structural supports suitable for equipment, or as indicated.
2. Check loadings and dimensions of equipment with shop drawings.
3. Do not cut or weld to building structural members.

L. Arrange for necessary openings to allow for the admittance of equipment. Where equipment cannot be installed as structure is being erected, provide and arrange for the building-in of boxes, sleeves, or other devices to allow later installation.

M. Install equipment to permit easy access for normal maintenance.
1. Maintain easy access to switches, motors, drives, pullboxes, receptacles, etc.
2. Notify Architect in writing of relocation items which interfere with access.

N. Provide concrete foundations or pads required for the electrical equipment, as follows or as otherwise indicated on the Drawings.
1. Refer to General Conditions and Division 1 as applicable for requirements.

2. Where Drawings do not show special foundations, install 3-inch thick housekeeping concrete pads and 4-inch wide edges.
3. Set anchor bolts for equipment.

O. Locate exit signs and fire alarm flashing lights so that both signs are visible from all corridor locations. In open areas, relocate signs as requested by the Architect or Owner, who must approve any relocation in writing to the Contractor.

P. No material, device or equipment shall be shipped to site unless Shop Drawings have been approved for such, prior to shipment.

Q. Sound Control: Install material and equipment in accordance with manufacturer's recommendation to minimize noise levels. Correct noise or vibration occurring as a result of installation or equipment at no cost to the Owner.

3.02 FIELD QUALITY CONTROL:

A. Tests:
1. Furnish necessary instruments and equipment required for making tests, test all wiring for shorts, open circuits, or grounding. Provide documentation of all tests upon request.
2. Immediately correct any defective work.
3. When the entire installation has been completed and lighting fixtures installed, test out circuits and switching, and demonstrate that operation of system is in accordance with Contract Documents.
4. Test, coordinate, and set ground fault interrupter devices under direction of approved third-party testing agency.

3.03 ADJUSTING AND CLEANING:

A. Cleaning: Clean exposed parts of lighting fixtures, electrical equipment and interior of panels, cabinets and switchboards of dirt, cement, and plaster and other materials. Replace or refinish all scratched or damaged materials.

B. Lighting Adjustment: At final night-time inspection, adjust lighting as required by the Architect.

3.04 SEISMIC PROTECTION:

A. Seismic Protection Criteria: Electrical and mechanical machinery installations in any Seismic Risk Zone of the Uniform Building Code Seismic Risk Map shall be protected from earthquakes. Protection criteria for these zones shall be a Horizontal Force Factor not less than required by Code or agency, considered passing through the machinery center of gravity in any horizontal direction. Unless vibration isolation is needed to protect the machinery against unacceptable structure transmitted noise and/or vibration, the machinery shall be protected from earthquakes by rigid structurally sound attachment to load supporting structure. The number of attachments shall be determined by the calculations performed by a registered California professional engineer (included in Contractor's bid) as verified by the seismic restraint vendor. Vibration isolated machinery shall be protected either by protected spring isolators or separate seismic restraint. Seismic snubbers and protected spring isolators shall be seismic protection rated in 3 principal axes by independent laboratory testing or analysis by an independent licensed structural engineer. The Contractor shall be responsible for the design of his own seismic restraint systems and shall supply all seismic calculations and details to the structural engineer/architect for review, and shall supply to the Owner and the Architect details of the forces exerted by the restraints, anchorages, and other points of attachment. Cost of seismic protection devices shall be included in the Contract Sum.

B. Electrical and Mechanical equipment shall be installed in accordance with the following guidelines:
1. SMACNA Publication: Guidelines for Seismic Restraints of Mechanical Systems.
2. California Code of Regulations (CCR), Title 24, Division 22.
3. NUSIG - National Uniform Seismic Installation Guidelines.

C. Contractor shall furnish Shop Drawings for the equipment mounting, conduit, and cable support racks; Shop Drawings shall be prepared, stamped, and signed by a Registered California Structural Engineer.

3.05 SETTING OF PROTECTIVE DEVICES: Prior to final completion of the Work, set all protective device relays and internal settings to provide adjustment between upstream and downstream protective devices. Setting shall be based on the accepted coordination study.

3.06 INDOOR LIGHTING FIXTURE INSTALLATION:

A. General:
   1. Verify final type of ceiling construction prior to ordering fixtures and provide mounting frame to match.
   2. Lighting fixtures recessed in plaster or dry wall ceilings shall be provided with plaster frames.
   3. Fixtures shall not be supported directly from ceiling tile, ductwork, piping, or horizontal conduits.
   4. All fixtures shall be supported by means of yokes or other mounting devices as recommended by fixture manufacturer. All supports shall meet NEC Article 410, Section D.
   5. All fixtures shall be clean and free of visible labels, markings, and lamp retainer gaskets prior to final inspection.
   6. All recessed lighting fixture trims shall meet flush with the ceiling and shall not have light leakage.
   7. All recessed lighting fixtures in removable ceilings shall be connected to modular wiring system to allow ease of relocation after installation.
   8. All lighting fixtures inside air handling units or in return air plenums shall be rigidly supported. Fluorescent fixtures shall not be mounted perpendicular to air flow nor directly in air flow.
   9. Fixtures installed in compressor, fan and similar equipment rooms and areas shall be located, and height adjusted, on job to clear obstructions such as ducts, piping, bracing, and supports. Locate fixtures so proper illumination will be obtained. Where location of fixtures shown on Drawings must be radically changed, notify the Architect.
   10. Fixtures shall be shipped to job completely assembled as units except stems, canopies, joiners, and other required fittings.

B. Fluorescent Fixtures (Ceiling Recessed Mounted):
   1. Fluorescent fixtures shall have frame suitable for installation in the type ceiling installed.
   2. Fluorescent fixtures with parabolic louvers shall be supplied and installed with protective plastic sheeting in place. This protective material shall not be removed until all painting and clean-up in areas of fixtures has been completed.
   3. Fluorescent fixtures shall be supported by rod hangers from building structure or other methods to adequately support the fixtures.
   4. All lenses and louvers shall be cleaned. Lenses shall be cleaned on both sides. All fingerprints and smudges on louvers shall be completely removed. All foreign material on all fixtures shall be removed.

C. Fluorescent Fixtures (Ceiling Surface Mounted):
   1. Fixtures surfaced mounted in continuous rows shall be mounted in exact horizontal alignment and free of vertical deflection and angular jointing.
   2. Fixtures mounted in rows along tee bars shall be supported independent of the ceiling with B-line #IDS clips.

D. Fluorescent Fixtures (Wall Recessed or Surface Mounted):
   1. Fixtures and trims shall be square and plumb. All openings around fixture trims shall be filled and finished with appropriate material.
   2. Surface mounted fixtures and recessed mounted fixture trim pieces shall be tight against mounting surface.

E. Fluorescent Standby Lighting Fixtures:
   1. Units shall be mounted fixed in place where indicated on the Drawings and be wired to normal unswitched power feeding lighting within the space.

F. Incandescent Fixtures (Ceiling Recessed Mounted):
   1. Fixtures shall be provided with frame-in kits for drywall or plaster ceilings or suspension bar hanger supports for tee bar ceilings.
   2. Provide the fixtures in drywall or plaster ceiling with accessible junction boxes through the fixture opening.
   3. Any reflectors shall fit tight to ceiling and be free of fingerprints, dust, and dirt.

G. Compact Fluorescent (Ceiling Recessed Mounting):
   1. Fixtures shall be provided with frame-in kits for drywall or plaster ceilings or suspension bar hanger supports for tee bar ceilings.
   2. All fixtures in drywall or plaster ceiling shall be provided with accessible junction boxes through fixture opening.
   3. Any reflectors shall fit tight to ceiling and be free of fingerprints, dust, and dirt.

H. Incandescent Emergency Lighting Units:
   1. Units shall be mounted fixed in place where indicated on the Drawings and be wired to normal unswitched power feeder lighting within the space.
   2. Test: Units shall be tested in darkened space after installation to insure the following:
      a. That relay operates on loss of normal power by de-energizing the panelboard circuits feeding normal lighting.
      b. Light heads are properly aimed and swivel joint tightened.

I. HID Fixtures (Bracket Mounted):
   1. HID fixtures shall be rigidly mounted.
   2. All fixtures shall be square and plumb.

J. HID Fixtures (Ceiling Recessed and Surface Mounted):
   1. HID fixtures in ceiling shall have frame suitable for installation in type ceiling installed.
   2. Surface mounted fixtures shall be rigidly fastened in place.

K. HID Fixtures (Wall Surface Mounted):
   1. Fixture shall be square and plumb.
   2. Surface mounted fixtures shall be rigidly fastened in place.

3.07 OUTDOOR LIGHTING FIXTURE INSTALLATION:

A. Pole mounted lighting fixture installation:
   1. All fixtures shall be installed in strict accordance with manufacturer's instructions.
   2. Contractor shall visually check each fixture housing for manufacturing flaws or misalignment of components such as gaskets, hinges, or lenses. Fixtures shall also be inspected for cracks, holes, or poor finish that will cause entry of moisture or insects, or cause rust to form thereby reducing the life of the housing. All flaws or misalignments shall be immediately called to manufacturer's and Architect's attention.
   3. The Contractor shall replace all fixture housings or components without cost, if in the opinion of the Architect such replacement is necessary to maintain the watertight integrity of the fixture.

B. Wall or Bracket Mounted Fixture Installation:
   1. The Contractor shall verify exact mounting location of fixtures to avoid interference with louvers, windows, doors and lintels. Where fixtures are shown above doors or openings into the building, they shall be centered on that door or opening.
   2. Unless otherwise noted, all fixtures of same type on a single side of the building shall be mounted in the same horizontal plane.
   3. All brackets shall be rigidly attached to the building with appropriate hardware.

C. Recessed, Surface or Pendant Mounted Fixture Installation:
   1. Recessed fixture faceplate shall be pulled tight to mounting surface to prevent entry of insects.
   2. Surface or pendant-mounted fixtures shall be rigidly attached to building or structure.
   3. Unless otherwise noted, all pendant-mounted fixtures of the same type below a single canopy or covered walkway shall have the bottom of the fixture mounted at the same horizontal plane.

D. Landscape Lighting Installation:
   1. Contractor shall verify exact location of all landscape lighting fixtures with the Architect and shall coordinate installation of lighting with contractor doing the landscape.
   2. Bollard Lighting Fixtures Mounted On-Grade:
      a. Fixtures shall be provided with a poured concrete base mounted flush with grade. Concrete shall be poured in an 18" diameter round mold about 18" deep after setting the anchor bolts and conduits. Coordinate with bollard detail on Landscape Drawings.
      b. All fixtures shall be mounted level and straight.
      c. All conduit attachments shall be watertight.
      d. The green grounding conductor shall be attached to the fixture housing.

3.08 LAMP INSTALLATION:

A. Contractor shall furnish and install all lamps. Lamps missing or burnt out at Architect's final inspection shall be furnished and installed or be replaced.

B. Fluorescent lamps with blackened ends shall be replaced.

C. Lamps shall be compatible with the lighting fixtures in which they are inserted.

3.09 BALLAST INSTALLATION:

A. All fluorescent or HID lighting fixtures shall be provided with ballasts. Ballasts shall be mounted inside the lighting fixture unless otherwise indicated.

B. Fluorescent Standby Lighting Ballasts:

1. For fluorescent standby lighting units, the inverter, battery, charger, and ballast shall be installed within the lighting fixture ballast chamber where possible.
2. Where fluorescent standby lighting units inverter, battery, charger, and ballast are mounted on top of the fluorescent lighting fixtures, adequate clearance shall be provided.
3. Remote test switch shall be installed in the light fixture and allow testing by pushing on the fixture lens or through the louver.
4. The fluorescent standby lighting units shall be wired to an unswitched circuit.
5. Integral Nicad battery pack equipped fixtures shall have combination battery pack/ballast and shall be capable of supplying each lamp in the fixture with power for 90 minutes per code.
6. Emergency battery packs for 4' fluorescent lamps shall be capable of providing a lumen output of at least 1100 lumens. Units shall be Emergilite FPSI/U series or approved equal.
7. Emergency battery packs for twin tube fluorescent lamps shall be able to provide lumen output of at least 90% of rated lamp lumens. Units shall be Emergilite FPDL7 series or approved equal.

3.10 INSTALLATION OF FUSES IN LIGHTING FIXTURES AND POLES:

A. Fixture fuses shall be installed on the line side of the ballast in each "hot" lead. Fuseholders in exterior fixtures shall be waterproof and have required terminals of size and type to match wiring. Fuse size and type (slow blow or quick blow) shall be as recommended by ballast manufacturer.

B. Pole base fuseholder shall be installed in the "hot" lead of each circuit running to top of pole. Fuse size shall be as required to protect the tap wiring run to the top of pole. Fuseholder shall be located and be accessible through handhole in pole base.

3.11 FLUORESCENT FIXTURE LENS INSTALLATION:

A. All fluorescent fixture lenses and louvers shall be framed unless otherwise indicated.

3.12 METAL LIGHTING POLE INSTALLATION:

A. Pole bases shall comply with requirements of CONCRETE BASES FOR LIGHTING POLES paragraph in this Section.

B. Top of concrete pole base shall be as indicated on the Drawings.

C. All underground wiring to poles shall be pulled in conduit. Conduit shall be Schedule 40 heavy wall PVC type, suitable for direct burial under paved areas. Backfill conduit with compacted sand. Conduit shall have a green full sized ground unless otherwise noted.

D. A leveling nut must be screwed down on each anchor bolt until it meets the concrete, then they must be adjusted until they are level. Poles shall be set on concrete base after concrete has cured. Pole shall then be securely fastened to anchor bolts with top nuts per torque values furnished by manufacturer.

E. Contractor shall wire lighting fixtures to the underground wiring and connect grounding conductor to grounding lug at each pole. Pole branch circuit wiring shall be tapped or spliced to the main wiring run and run up in the pole to lighting fixtures.

F. Pole alignment shall be accomplished on a calm and cloudy day or early in the morning before solar radiation has expanded one side of the pole causing thermal deflection. Alignment shall be within one degree of vertical following manufacturer's instructions.

G. Solidly grout the void that appears between pole baseplate and concrete pole base using a non-shrinking mortar grout. A short piece of copper pipe shall be installed through the grout to pole interior to provide a drain hole.

3.13 INSTALLATION OF CONCRETE BASES FOR LIGHTING POLES:

A. Piers shall be machine drilled to shaft diameters, depths, and locations as indicated on Drawings.

B. Any deviations from the Drawings in size and shape of pier shall be such that shaft at cut-off elevation is off-center not more than 3" and shaft shall not be out-of-plumb more than 1% of its length.

C. Excavation shall be advanced by any practical method which would not adversely affect performance of completed piers or existing adjacent facilities. Pier excavations shall be maintained in an essentially dry condition by pumping, if necessary, until just prior to concreting.

D. All loose earth falling into excavation, whether cave-in, kicked in from surfaces or whatever cause, must be removed immediately and completely prior to and during the placing of concrete.

E. Conduct the work so safety of workmen and public is assured at all times. Open holes, where finished concrete does not reach surface, shall be barricaded, covered, or otherwise protected continuously. No holes shall be left open overnight.

F. Reinforcing Steel:

1. Position reinforcement in accordance with placement plans.
2. Maintain reinforcement securely in position in a manner that will hold reinforcing in place during concrete placing. Tie bars at intersections with soft steel wire.
3. Metal reinforcement, just prior to time concrete is poured, shall be inspected and cleaned of flaky rust, mud, oil, ice, concrete splashings, or any other foreign material that will destroy or reduce the bond.
4. After bars are tied in place, take whatever precautions are necessary to protect bars from damage by construction equipment or careless workmen. Damaged steel shall be replaced at no cost to the Owner.

G. Anchor Bolts: Anchor bolts shall be installed using plywood or steel template to insure correct spacing and positioning to match the final desired pole orientation. Take care to insure that bolts remain plumb while the concrete is being poured.

H. Power Conduits: Power conduits shall extend a minimum of 3 feet outside of concrete pier below grade and be capped. Insulated bushings shall be provided on all conduits stubbed above pole base.

I. Grounding: All metal poles shall be grounded with separate ground wire and ground rod. Ground wire shall be in 1/2" conduit run at right angles to power conduits. Conduit for ground wire shall extend a minimum of 2 feet from pier below grade.

J. Concrete:

1. Concrete shall be placed immediately after reinforcement steel is installed, and anchor bolts and conduit are set.
2. All piers shall be poured monolithically. However, if any pour is interrupted in such a manner as to allow the in-place concrete to set for more than one hour before pouring is resumed, surface of in-place concrete shall be leveled. Just before concreting is resumed, all laitance shall be cleaned from existing surface and surface roughened and slushed with a 1:1 cement grout.
3. Fresh concrete, after placing, shall be kept at a minimum temperature of 50°F for the first 72 hours and kept at a temperature above freezing for the next 72 hours. Use of salt or chemical to prevent freezing will not be permitted.
4. Conform to recommendations in ACI 306.
5. Concrete damaged by freezing shall be removed and replaced under this Section at no additional cost to the Owner.

3.14 INSTALLATION AND TESTING OF LIGHTING CONTROLS:

A. Provide all wiring, in conduit, to photocells and contactors to provide a complete and operable system.

B. Photocontrol shall be installed at remote location as shown on the Drawings facing a northerly direction.

C. Lighting contactors shall be mounted in an accessible location and be labeled with nameplate reading "Exterior Lighting".

D. Test system after installation to verify correct operation of all associated relays, photocells, and controls.

3.15 TESTING:

A. On completion of the Work and adjustment of all equipment, conduct an operating test of each system for approval. The Contractor shall pay for a testing agency to conduct the tests in the presence of the Owner and/or Architect. Demonstrate that all systems and equipment operate in accordance with all

requirements of Contract Documents and are free from all electrical and mechanical defects. Provide all systems free from short circuits and grounds, and show insulation resistance between phase conductors and ground of not less than 250,000 ohms for all feeders and circuits of 60 amps ampacity and higher.

B. Perform resistance to ground tests by Journeymen Electricians and the required number of apprentices to measure resistance to ground at all grounding electrodes. Make tests before slabs of affected areas are poured in order that corrective measures, if required, may be taken. If the resistances exceed the values specified herein, perform all corrective measures as approved by the Architect or Owner.

C. Prior to energizing any motors, measure the service voltage for phase balance and report immediately to the Architect if unbalance exceeds 1% from mean.

D. Measure the three-phase voltage at no load and at maximum load conditions.

E. Complete all tests prior to final field observation of project, including corrective work based on results of the tests.

END OF SECTION

SECTION 16135

SURVEILLANCE SYSTEMS BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY: Division 1 and Section 16100 apply to this Section. Provide Surveillance Systems Basic Materials and Methods, complete.

A. Work Included: The following list is not to be construed as complete. Included are the following:

1. Conduit, backboxes, pull lines, and related Work for surveillance systems installation.
2. Electrical supply adjacent to surveillance systems equipment locations, as noted on Drawings.
3. Line and low voltage control circuits for operation of Surveillance Systems equipment as defined on Electrical and Surveillance Systems Construction Documents.

B. Related Work:

1. Section 16100 - Electrical Basic Materials and Methods.
2. Surveillance equipment and wiring will be provided by others.

1.02 SUBMITTALS: Conform to submittal requirements of Sections 01330 and 16100.

A. Product Data: Submit copies of material list.

B. Shop Drawings: Submit as part of submittals required under Section 16100.

1.03 QUALITY ASSURANCE:

A. Regulatory Requirements:

1. Comply with State Electrical Safety Orders and local codes and ordinances.
2. Materials shall be listed by Underwriters' Laboratories Inc., and shall bear the Inspection Label.
3. Materials shall meet with the approval of the Division of Industrial Safety, State of California, and all governing bodies having jurisdiction.

B. Electrical Power and Telephone Services: Electrical power and telephone services and metering facilities shall conform to the requirements of serving Utility Companies and shall meet with approval of local and state inspecting authorities.

C. Electrical Acceptance Tests:

1. General Scope:

a. As part of the Contract, Contractor shall perform tests of installed work as herein specified and specified in other Sections of Division 16.
b. The Contractor shall provide all materials, equipment, labor, and technical supervision to perform such tests and inspections.
c. All tests shall be performed in compliance with recommendations and requirements of the National Electrical Testing Association, Inc., (NETA), and applicable codes and standards.
d. Upon completion of the tests and inspections noted herein, a label shall be attached to all serviced devices. These labels shall indicate date serviced and service company responsible.
e. The tests and inspections shall determine suitability for continued reliable operation.
f. All tests shall be conducted in the presence of the Owner and/or Architect.

g. Test reports shall include:
   (1) Description of equipment tested.
   (2) Description of test.
   (3) Test results.
   (4) Conclusions and recommendations.
   (5) Appendix, including appropriate test forms.
   (6) List of test equipment used and calibration date.

1.04 PRODUCT HANDLING: Deliver materials to job site in original unbroken package, properly tagged with UL Label, size, type, and manufacturer indicated or specified.

1.05 LOCATION AND ROUTING: The Drawings indicate diagrammatically the desired location or arrangement of outlets, equipment, etc., and are to be followed as closely as possible. Judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions. The Contract Documents are not intended to show every detail part, support, final connection, accessory, or every structural difficulty that may be encountered during the work. Except as otherwise indicated, locations of items are approximate only. Exact locations necessary to secure proper conditions and results shall be determined at project site and shall be approved by the Owner's Representative.

A. Use only sweep conduits for blind pulls and for inaccessible bends; do not use elbow connectors. Minimum sweep shall be 18" radius.

B. Locations shown on Architectural Ceiling Drawings or on wall elevations shall take precedence over electrical plan locations.

C. Verify dimensions and the correct location of equipment before proceeding with the roughing-in of connection.

D. Surveillance devices in mechanical spaces, machine rooms, electrical and telephone rooms are shown in their approximate locations only. Do not install device backboxes or fixtures until mechanical piping and ductwork are installed; then device backboxes and fixtures shall be installed in locations best suited for equipment arrangement and as approved by the Owner or Architect. Verify the locations of fixtures in elevator machine rooms before installation.

E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc., with the Drawings to see that the equipment being installed will fit into the spaces provided.

F. Access to Equipment: Locate switches, receptacles, cable tray and pullboxes to provide easy access for operation, repair, maintenance to comply with code, and if concealed, provide access doors.

G. The Contractor shall be responsible for verifying that equipment being provided will fit dimensionally in locations shown on the Drawings.

1.06 MATERIALS STANDARDS: Materials and equipment shall be new.

A. All Work of this Section shall meet the requirements of the governing codes and regulatory requirements as listed herein, and the requirements of the following:

1. National Electrical Manufacturer's Association (NEMA).
2. American National Standards Institute (ANSI).
3. Institute of Electrical and Electronic Engineers (IEEE).
4. Institute of Cable Engineers Association (ICEA).
5. National Electrical Contractors' Association Standards for Construction (NECA).

6. Underwriters' Laboratories, Inc. (UL).
7. California Code of Regulations (CCR) Titles 8, 19, 22 and 24.
8. California State and Local Fire Marshals.
9. Instrument Society of America (ISA).
10. California Electrical Code, (T-24, latest edition).
11. National Fire Protection Association (NFPA).
12. State Industrial Accident Commission.
13. Uniform Building Code, latest edition (UBC).
14. Occupational Safety and Health Appeals Board (OSHA).

B. Items for similar application shall be of the same manufacturer.

C. The label of listing by UL shall appear on all materials and equipment for which standards have been established by the agency.

D. Where codes establish label or approved requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.

E. Provide the type and quantity of electrical materials and equipment necessary to complete work and all systems in operation, tested and ready for use.

F. Provide all incidental items that belong to the Work described and which are required for complete systems.

G. All switchgear, switchboards, distribution boards, panelboards, circuit breakers, and transformers shall be of the same manufacturer.

1.07 TESTING

A. Upon completion of the work and adjustment of all equipment, verify all conduit is clear ands free of debris or obstructions.

B. Provide and identify pull lines in all conduits, accessible at designated and/or required pull box locations. Demonstrate pull lines viability to Owner.

C. Provide bushings on all conduit ends not terminating in boxes, and provide bushings on box openings not connected to conduit.

D. Complete all tests prior to final field observation of project, including corrective work based on the results of the tests.

1.08 TRAINING: Refer to Section 16100.

1.09 PROJECT CONDITIONS: Notify the Owner and Architect in writing of dimensional discrepancies and other conditions detrimental to proper performance of the work.

PART 2 - PRODUCTS

2.01 MATERIALS: Use only prime quality, new materials, apparatus, and equipment.

A. Conduit:

1. Rigid Conduit: Shall have UL Label, zinc coated exterior, either hot dip galvanized, sherardized, or metallized, and zinc enamel interior; set screw fittings are not permitted.

2. PVC Jacketed Conduit: Rigid steel conduit and fitting with a 20 mil extruded polyvinyl chloride jacket and internal galvanized surface. The jacket shall have high tensile strength, shall be highly resistant to corrosion and shall not oxidize or deteriorate or shrink when exposed to sunlight and weather. The jacket shall be flame retardant and shall not support combustion, UL label.

3. Electrical Metallic Tubing: UL Label, zinc coated exterior and zinc or enamel interior; fittings for EMT shall be steel gland ring compression type. Type AC cable shall not be used. Type MC cable may be used as a deductive alternate upon prior approval and where permitted by Governing Authorities; see Deductive Alternatives Article herein.

4. Flexible Metallic Conduit: UL Label, zinc coated exterior and interior; fitting for flexible conduit shall be "JAKE" or Squeeze type, set screw connectors shall not be used.

5. Liquid-Tight Flexible Conduit: Sealtite type U.A. with Appleton Series "ST" or Pyle-National Series "CT" connectors.

6. Non-Metallic Conduit:

   a. Shall be Type I per UL 651, and shall be equivalent to "PVC Schedule 40" as manufactured by Carlon. All sweeps, bends and risers shall be concrete encased schedule 80.
   b. All high-voltage conduit, telephone conduit, service entrance conduit, and feeders 100 amps and over shall be encased in 3" red mixed concrete when buried in site.
   c. Non-metallic flexible tubing shall not be used.

B. Sealant: Fire rated equal to wall or ceiling penetrated. Silicon foam Dow-Corning #2001, General Electric Co., "Pensil #851," or approved equal.

C. Conduit Seals: Crouse-Hinds Type "EYS" or "EZS", Appleton Type "ESUF" or ESUM", or approved equal, with sealing compound as recommended by the manufacturer for hazardous or refrigerated areas.

D. Racks and Trapeze Hangers: Formed steel channels similar to Unistrut.

E. Vibration Fittings and Seismic Expansion Joints: O.Z. Type DX. Provide seismic couplings/joints as required per code.

F. Outlets and Junction Boxes:

1. Galvanized or sherardized, one piece pressed steel, knock-out type.
2. Size of each box determined in accordance with National Electrical Code for number of conductors or number and size of conduits entering box, but not less than 4 inches square and 1-1/2 inches deep.
3. Telephone outlet boxes shall be a minimum of 4 inches square and 2-1/8 inches deep.
4. Outlet boxes installed in concrete for fixtures, 4-3/8 inch octagonal concrete box with minimum depth of 2-1/2 inches.
5. Outlet boxes installed in concrete for wiring devices, 4 inches square by 1-1/2 inch deep concrete box with 1-1/4 inch deep cover plate.
6. Exposed outlet boxes, cast metal with threaded or union hub, Crouse-Hinds type "FS" or "FD" with cast metal covers.
7. Outlet boxes installed in masonry walls, masonry type with square corners and without exterior mounting ears, or standard 4S box with 2 inch masonry extension ring. Installed in conjunction with coursing.

G. Pullboxes: In no case of less size or material thickness than required by the governing electrical code.

1. General Purpose Sheet Steel Pull Boxes: Furnished with removable screw covers and the manufacturers standard baked enamel finish.

2. Weatherproof Sheet Steel Pullboxes: Fabricated of code gauge hot-dipped galvanized steel and gasketed weathertight cover of same materials; manufacturer's standard baked exterior enamel finish.

3. Cast Metal Pullboxes: Furnished with gasketed screw covers and necessary drilled and tapped conduit entries; screws shall be bronze or brass.

H. Floor Mounted Outlets and Boxes:

1. In floor boxes mounted in slabs on grade to be watertight cast iron boxes with number of gangs per plans, combine all floor receptacles, telephones and data outlets at a single location into one floor box UON. All boxes shall be 3-3/8" deep with 1-7/8" minimum adjustment before pour and 1/2" adjustment capability after pour. Boxes shall be finished out flush with final floor finish. Boxes shall be as manufactured by Walker or approved equal as follows:

Gang	880CS1
Gang	880CS2
Gang	880CS3

2. In floor boxes mounted in slabs above grade level to be concrete tight stamped steel with number of gangs per plans. Combine all floor receptacles, telephone and data outlets at a single location into one floor box UON. All boxes shall be 3-15/32" deep with 2" minimum adjustment before pour and 1/2" minimum adjustment capability after pour. Boxes shall be finished out flush with final floor finish. Boxes shall be as manufactured by Walker or approved equal as follows:

Gang	880S1
Gang	880S2
Gang	880S3

I. Boxes Finishes:

1. Box trim plates shall match final floor finish in area installed.
2. Hard finish floors shall use brass tile rings, Walker #817T, 827T and 837T or approved equal as appropriate.
3. Carpet finished floors shall use brass carpet flanges, Walker 817C, 827C, 837C or approved equal as appropriate.
4. Receptacle covers shall be Walker #828R.
5. Tele/data covers shall be Walker #829S.
6. Partition feed covers shall be Walker #829CK-1.
7. Poke Through Type Infloor Outlets:
   a. All poke throughs are to be fire rated to match floor being penetrated. Verify floor fire rating before installation. Coordinate floor penetration locations with project Structural Engineer in writing prior to core drilling penetration. In any buildings with post-tensioned slabs the floor shall be x-rayed prior to core drilling.
   b. Poke throughs are to be Walker #1570-A (duplex receptacle), Walker #1990-A (Quadplex receptacle), Walker 15AM Series for tele/data outlets, coordinate the exact jack type(s) with the Owner's telecom installer prior to project completion.
   c. Poke through for partition furniture fees shall be Walker #1620-PF50/75 or approved equal.

J. Wire and Cable: Low voltage and signal surveillance cables shall be by others. Provide empty conduit and pull lines for cable. Adhesive marker, "Brady" as distributed by Graybar Electric.

K. Grounding: Grounding bushings shall be used wherever conduits are grounded.

L. General Purpose Receptacles: Shall be specification grade, 2P-3W, with provisions for back-wiring from eight separate wiring openings with screw activated clamp type terminals and side wiring with captively held binding screws.

1. Receptacle cover shall be high-impact, chemical resistant nylon and housing shall be high-impact, chemical resistant ABS/PVC or equivalent. Mounting strap shall be wrap-around design and grounding contact must be heavy-duty type.

2. They shall be listed by UL and verified as meeting Fed Spec W-C-596F.

M. Receptacles: Shall be General Electric or approved equal by Hubbell, Bryant, or Pass & Seymour.

1. Duplex Receptacles:

GE5262-7 15A-125V White
GE5362-7 20A-125V White or color as approved by Architect

2. Single Receptacles:

GE5261-7 15A-125V White
GE5361-7 20A-125V White or color as approved by Architect

3. Isolated Ground Duplex Receptacles:

GE5262-IG 15A-125V Orange
GE5362-IG 20A-125V Orange

4. GE Color Suffix: (-1) Brown, (-2) Ivory, (-7) White, (- 8) Red, (-9) Gray.

5. Receptacles shall be installed with the "U" grounding contact at the top. Where receptacles are mounted horizontally they shall be installed with the neutral contact at the top.

6. Special Receptacles: As indicated on Drawings.

7. Approvals: All receptacles shall be submitted for Shop Drawing review and color approval to the Architect and Engineer.

N. Plates:

1. All switches, receptacles, telephone, CRT and blank outlets shall be of white finish unless noted otherwise. General Electric, Hubbell, Bryant, or Pass & Seymour.

2, Outlets on exposed conduit runs shall have cast conduit fitting device covers.

3. Plates requiring engraved lettering shall be as:
   a. Contactor control switches.
   b. Key operated switches.
   c. Switches with pilot lights.
   d. Motor, heating and ventilating control switches.
   e. Switches where outlets or switch equipment are not visible from switch location.

O. Mounting Facilities: Provide mounting facilities required for properly securing of hanging fixtures, equipment and outlets. Provide sleeves, inserts, expansion joints, and all components as required.

2.02 DEDUCTIVE ALTERNATES: There are no deductive alternates for this Section.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Location and Verification of Dimensions: Scaled and figure dimensions are approximate and are given for estimating purposes only. Before proceeding with work, check and verify dimensions and sizes and assume responsibility for fitting of all materials and equipment to other parts of equipment and to the structure. Where apparatus and equipment have been indicated on drawings, dimensions have been taken from typical equipment of the class indicated. Check the drawings to see that equipment to be installed will fit into the spaces provided.

B. Install materials and equipment in accordance with each manufacturer's recommendations, instructions, industry standards.

C. Trench and Backfill: Provide trenching, concrete encasement of conduit, backfilling and compaction for underground high voltage system.

D. Conduit:

1. Rigid Conduit: Shall be used when installed in concrete slabs, encased in concrete below slabs, in concrete or masonry walls, exposed on building exterior or exposed on interior walls below 4'-0" above floor, and where required by code.
2. Rigid conduit in concrete in contact with earth, except below slab, shall be encased 3" on all sides with red mixed concrete envelope. Concrete mix shall be 5.5 sack, using pea gravel as aggregate.
3. Protection -- wrap runs underground with either Hunt's "Process No. 3" or Scotch "No. 50 tape", half-lapped.
4. EMT: Use only for concealed interior runs or exposed interior runs 4'-0" above floor.
   a. EMT may be used on roofs under the roofing, and where protected by adjacent rigid roof insulation.
   b. EMT shall not be cast in concrete or installed in masonry walls.
5. Flexible Conduit: Use in movable partitions, where indicated on Drawings, and in other locations due to structural conditions as permitted by code and with review of the Architect.
6. No conduit and fittings shall be used without prior review.
7. Seal-Tite flexible conduit shall be used for all the final connections to motors and in wet, damp, or outdoor areas where Drawings indicate use of flexible conduit.
8. Terminate conduit runs to rotating, adjustable, or movable equipment with flexible connections.
9. Install flexible isolating connections in the conduit runs between the building structure and the air conditioning equipment, transformers, or other equipment transmitting vibration or noise.
10. Do not use threadless conduit couplings for rigid conduit except for connections requiring union.
11. Rigid conduit shall be terminated with metallic bushings.
12. Install three 3/4 inch empty conduits from each flush mounted panelboard to the accessible above ceiling space where conditions occur. Cap conduit with standard galvanized pipe caps.
13. Mark underground conduit stubs from building with stainless steel plate located +12 inches above stubouts on exterior wall of building and engraved to indicate size and direction of stubs. Conduit stubs terminating more than 20 ft. from building shall have installed, over end of stub, 6 inch x 12 inch deep concrete block, flush with finished grade elsewhere. Provide a 3 inch x 3 inch brass plate, engraved "ELECT", secured to block with brass dowels.
14. Conduit shall not be embedded in concrete slab less than 4 inches thick and conduit 1-1/4 inch and larger shall not be installed in slab. Install conduit embedded in concrete slabs not on grade between reinforcing bars and bottom of slab. For slabs on grade, install conduit below the slab as specified.
15. Non-metallic conduit shall be installed underground and in duct banks. Bends and risers shall be Schedule 80, concrete encased. Risers shall terminate at the panels and pullboxes with double locknuts and insulated grounding bushing. Bare copper ground wire shall be installed in conduit

runs between panels and pullboxes and connected to ground bushing at each end. Ground wire shall be code sized or as indicated on Drawings. Non-metallic conduit shall not be installed in concrete slabs or panels.

16. Non-metallic conduit in duct banks shall be installed as described in Concrete Encasement.
17. Provide secure mounting facilities for conduits. Do not use wire or plumbers tape for hanging of suspended conduit. Do not secure conduits to suspended ceiling hanger wires or to suspended ceiling structure.
18. Provide junction or pullboxes where required for pulling conductors due to excessive numbers of bends or the lengths of conduit runs. Provide separation on voltages for all enclosures. All boxes shall be code sized.
19. Provide expansion couplings wherever conduits cross expansion or seismic joints or for continuous straight runs in excess of 100 feet except if embedded in concrete. Expansion fittings shall have bonding jumper or be of grounding type.
20. Re-route conduit where necessary to clear structural and mechanical obstructions.
21. Bury underground conduit, except under buildings, to depth of not less than 24 inches below the finished grade. Bury runs smaller than 1-1/4" to minimum depth of 6 inches under floor slabs and provide 3 inches concrete encasement. For conduit 1-1/2" and larger, trench sufficiently under the floor slabs to provide minimum buried depth of 36 inches below finished grade. Minimum depths are to top of concrete envelopes.
22. Install long radius bends in underground service conduits and in other long underground runs in excess of 100 feet. Do not flatten or kink bends.
23. Run conduits at right angles or parallel to the structural members, walls, floor and ceiling. Secure conduits 1-inch and smaller with one-hole malleable iron straps. Secure conduits 1-1/4 inch and larger with conduit hangers or 2-hole galvanized straps. Support suspended conduits with conduit hangers and 1/4inch hanger-rod. Rack mount or suspend multiple conduit runs on trapeze hangers with 3/8 inch rods.
24. Conduits installed in concrete, wet locations, exposed to the weather, or underground shall have threads filled with red lead and oil before screwing into couplings and threaded fittings.
25. Run conduits in spaces above suspended ceilings parallel to walls and floors.
26. Coordinate conduit runs in roof insulation and for securing of conduit runs above finished roof.
27. Where more than two conduits are installed in one common concrete envelope, separate conduits with conduit spacers.
28. Conceal conduit above ceiling, or in walls, unless otherwise noted.
29. A separate conduit shall be installed for each homerun indicated on the Drawings.

E. Paint fire alarm conduits with a 1-inch wide red band every 5 feet of run.

F. PVC jacketed rigid steel conduit where used in soil below the building. Wrap all joints with 4 layers of 10 mil PVC tape. All conduit and fillings which have damaged PVC coating shall be replaced at the Contractor's expense.

G. Provide a green insulated ground conductor of size as required by code or parity size as noted in all flexible and PVC conduit runs, and in metallic conduit where noted.

H. Do not strap or fasten rigid conduit to mechanical equipment, or to equipment subject to vibration or mounted on shock absorbing bases.

I. Conduits which are installed above dry type suspended ceilings shall not be secured to ceiling support wires. Support such conduit independent of ceiling suspension systems.

J. Support conduit to structure above suspended ceiling 8" minimum above ceiling to allow removal of ceiling tile. Do not support from T-bars or T-bar hanger wires. Maintain 5-inch clearance above recessed light fixtures.

K. Support conduits adjacent to walls with preformed channels.

L. Provide plated or galvanized hangers, rods, channels and metallic support and fastening material.

M. Conduit shall not be run closer than 12 inches to any hot water pipe, steam pipe, heater flue or vent. Maintain minimum 6 inches clearance between conduit and piping.

N. Conduits in furred spaces shall be routed to clear access openings.

O. Upon completing the installation of any run of conduit, the runs shall be tested to see that they are free from all obstructions and have a smooth interior. Install pull ropes ready to pull circuit conductors.

P. Seal:

1. Conduits terminating where termination is subject to moisture or where conduit penetrates exterior wall or roof shall be sealed.
2. Seal all conduit from exterior outlets at first interior junction to prevent moisture from entering the building through the conduit.
3. Seal all conduit to sump pump motors and control panel.
4. Seal all conduit that passes through the following areas:
5. As indicated on the Drawings.
6. Classified (hazardous) area.
7. Refrigerated area.
8. Temperature control room such as cold room or warm room.

Q. Seal Material shall be Johns-Manville "Dux Seal", Minnesota Mining and Manufacturing Co. "Scotchfil", or equal.

R. Empty Conduit:

1. Provide a nylon or a 3/32-inch O.D. polyethylene rope, rated at 200 pounds tensile strength, in all conduits more than 5 feet in length left empty for future use. Not less than 3-feet of rope shall be left at each end of the conduit.
2. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit and the location of the other end.
3. Cap the open ends of conduits with approved manufactured conduit seals until ready to pull in the conductors.

S. Duct Banks: Shall have a continuous slope downward toward manholes and away from buildings with a pitch of not less than 4 inches in 100 feet. Changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by longs weep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at ends of short runs of 100 feet or less, and then only at or close to the end of a run.

3.02 INSTALLATION OF 600 VOLT CONDUCTORS:

A. Conductors shall be continuous between outlets or junction boxes and no splices shall be made except in outlet boxes, pullboxes, panelboard gutters, or handholes. Feeders shall not be spliced in pullboxes.
B. All joints, splices and taps #10 and smaller (including fixture pigtails) shall be connected with "Ideal" wire nuts.
C. Oil or grease shall not be used when pulling the conductors. Use only acceptable cable lubricants. The conductors shall not come in contact with earth or be laid out on concrete slabs while being installed.
D. Train and lace conductors neatly in panels, cabinets, and equipment.
E. Tighten pressure type lugs on panels and equipment, and re-tighten 24 hours later.
F. Tagging of conductors:
   1. Tag the branch circuits in panelboards, in gutters, and in junction boxes wherever unused circuits terminate for purpose of identifying various circuits.

2. Tag feeders and mains in switchboards.
3. Tag with adhesive type of marker manufactured by "Brady" as distributed by Graybar Electric Co.

G. Install #12 galvanized steel pull wire in empty conduits.
H. Separate conductors of different voltages in independent raceways and enclosures.

3.03 FLASHING: Fasten to roof and flash the conduits passing through roof and exterior walls in a manner acceptable to the Architect.

3.04 PULLBOXES:

A. Exercised care in locating underground pullboxes to avoid installing in any drain water flow areas.
B. General purpose sheet steel pullboxes shall be installed only in dry protected locations and shall have removable screw covers.

3.05 JUNCTION BOXES:

A. Outlet boxes shall be mounted at vertical center of block where mounted in masonry walls.
B. Outlet boxes shall be securely fastened to structure.

3.06 SURVEILLANCE SYSTEMS ELECTRICAL WORK:

A. Outlet boxes shall be mounted at vertical center of block where mounted in masonry walls.
B. Outlet boxes shall be securely fastened to structure.
C. Review Mechanical Drawings for all control wiring, power supplies, interfaces, door releases, and other electrical coordination requirements.
D. Rough-in locations for fixtures and equipment shall be determined from the unit itself or from approved Shop Drawings.
E. Provide all necessary anchoring devices and supports.
F. Use structural supports suitable for equipment, or as indicated.
G. Check loadings and dimensions of equipment with Shop Drawings.
H. Do not cut or weld to building structural members.
I. Arrange for the necessary openings to allow for admittance of equipment. Where equipment cannot be installed as the structure is being erected, provide and arrange for building-in of boxes, sleeves, or other devices to allow later installation.
J. Install equipment to permit easy access for normal maintenance.
K. Maintain easy access to switches, motors, drives, pullboxes, receptacles, etc.
L. Notify Owner and Architect in writing of relocation items which interfere with access.
M. No material, device, or equipment shall be shipped to site unless Shop Drawings have been approved for such, prior to shipment.

3.07 SOUND CONTROL: Install all the material and equipment in accordance with each manufacturer's recommendation to minimize noise levels. Correct noise or vibration occurring as a result of installation or equipment at no cost to the Owner.

3.08 FIELD QUALITY CONTROL:

A. Tests: Furnish necessary instruments and equipment required for making tests, test all wiring for shorts, open circuits, or grounding. Provide documentation of all tests upon request.
B. Immediately correct any defective work.
C. Test, coordinate, and set ground fault interrupter devices under direction of approved third-party testing agency.

3.09 ADJUSTING AND CLEANING: Clean exposed parts of fixtures, electrical equipment, and interior of panels, cabinets, and switchboards of dirt, cement, and plaster and other materials. Replace or refinish all scratched or damaged materials.

3.10 SEISMIC PROTECTION:

A. Seismic Protection Criteria: Electrical and mechanical machinery installations in any Seismic Risk Zone of the Uniform Building Code Seismic Risk Map shall be protected from earthquakes. Protection criteria for these zones shall be a Horizontal Force Factor not less than required by code or agency, considered passing through the machinery center of gravity in any horizontal direction. Unless vibration isolation is required to protect machinery against unacceptable structure transmitted noise and/or vibration, machinery shall be protected from earthquakes by rigid structurally sound attachment to the load supporting structure. The number shall be determined by calculations performed by a registered California professional engineer (included in Contractor's bid) as verified by the seismic restraint vendor. Vibration isolation machinery shall be protected by protected spring isolators or separate seismic restraint vendor. Seismic snubbers and protected spring isolators shall be seismic protection rated in three principal axes by independent laboratory testing or analysis by an independent licensed structural engineer. The Contractor shall be responsible for the design of its own seismic restraint systems and shall supply all seismic calculations and details to the structural engineer/architect for review., and shall supply to the Owner and Architect details of the forces exerted by its restraints, anchorages, and other points of attachment. Seismic protection devices shall be included in the Contract Sum.

B. Electrical and Mechanical equipment shall be installed in accordance with the following guidelines:

1. SMACNA Publication: Guidelines for Seismic Restraints of Mechanical Systems.
2. California Code of Regulations (CCR), Title 24, Division 22.
3. NUSIG - National Uniform Seismic Installation Guidelines.

C. Submittal: Contractor shall furnish Shop Drawings for equipment mounting, and conduit and cable support racks. These Shop Drawing shall be prepared, stamped, and signed by a Registered California Structural Engineer.

END OF SECTION