SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for furnishing and installing metal fabrications made from steel shapes, plates, bars, strips, tubes, pipes and castings not a part of structural steel or specified in other Sections, including but not limited to the following items:

1. Tubular framing for rolling door guides.

2. Pit cover plates.

3. Miscellaneous steel framing for partition supports.

4. Angle corner guards and edge guards, painted and galvanized.

5. Handrail brackets.

6. Trench drains and drain covers.

7. Countertop support brackets.

8. Guardrails, railings and handrails.

9. Steel grilles and gates.

10. Elevator guide rail support brackets.

11. Pulling irons, inserts, and other miscellaneous steel shapes.

12. Steel pipe bollards.

13. Pipe and duct guards.

14. Stair nosings.

15. Steel gratings at Parking Structure exhaust and air intake areaways.

16. Stainless steel handrails at site stairs at Spring Street and Broadway.

17. Steel cable rail barriers at Parking Structure.

18. Welded steel grease duct from Kitchen and Servery to roof fan at penthouse level.

19. Miscellaneous angles, plates, bars, rods and other items not specified in other Sections but shown or required to complete the work.

B. Related Sections:

1. Metal stairs are specified in Section 05 51 00.

2. Metal ladders are specified in Section 05 51 33.

1.02 SYSTEM PERFORMANCE REQUIREMENTS

A. Handrails and Railings: Design, engineer, fabricate and install railings and handrails to withstand the following structural loads:

1. Top Rail of Railing System: Capable of withstanding a lateral load of 50-psf applied horizontally at right angles to the top rail.

2. Handrails: Capable of withstanding a load of 200-psf applied at any direction and point along the handrail.

3. Handrails and Railings shall comply with ADA requirements.

1.03 SUBMITTALS

A. General: Comply with Section 01 33 00.

B. Product Data: Include information on cast nosings, treads, steel floor plate, paint products, and grout.

C. Shop Drawings: Include plans, elevations and details of metal fabrications and their connections. Show anchorage and accessory items. Furnish templates for anchors and bolts installed under other Sections.

D. LEED Submittals:

1. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

a. Furnish the LEED Online Credit Template listing all the paints and coatings used in the building, stating they comply with the VOC and chemical component limits of GS-11 requirements.

1.04 QUALITY ASSURANCE

A. Stairway handrails shall comply with California Building Code (CBC) Section 1133B.4.1.

B. Ramp handrails shall comply with CBC Section 1133B.5.5.

C. Ramp guardrails shall comply with CBC Section 1133B.5.7.

D. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to those required for this Project, with sufficient production capacity to produce required units without causing delay in the work.

E. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS D1.1, D1.2, and D1.3 as applicable. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved.

1.05 ENVIRONMENTAL QUALITY ASSURANCE

A. Credit IEQ 4.2: Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the following criteria:

1. Architectural paints, coatings and primers applied to interior walls and ceilings: Do not exceed VOC content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.

a. Flats: 50 g/L

b. Non-Flats: 150 g/L

2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Do not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.

B. Applicable LEED Credits:

1. Credit IEQ 4.2 – Low-Emitting Materials - Paints and Coatings.

1.06 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule to avoid delay of work.

1.07 SEQUENCING AND SCHEDULING

A. Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where the location of concealed anchor plates has been marked for the installer.

B. Painting: Items specified in this Section as having a shop applied prime coat will be job painted as specified in Section 09 91 00, unless otherwise noted.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. General: For fabrication of metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

B. Steel Plates, Shapes and Bars: ASTM A36.

C. Steel Tubing: Cold-formed, ASTM A500; or hot-rolled, ASTM A501.

D. Structural Steel Sheet: Hot-rolled, ASTM A570; or cold-rolled ASTM A611, Class 1.

E. Galvanized Structural Steel Sheet: ASTM A653, galvanized in accordance with ASTM A525, G90 coating designation.

F. Steel Pipe: ASTM A53; type and grade selected by fabricator; black finish unless galvanizing is specified; standard weight, schedule 40.

G. Gray Iron Castings: ASTM A48, Class 30.

H. Malleable Iron Castings: ASTM A47, grade selected by fabricator.

2.02 ALUMINUM

A. Extrusions: ASTM B221, alloy 6063-T6.

B. Sheet: ASTM B209, alloy 5005-H15.

C. Bars, Rods and Wires: ASTM B211.

D. Drawn Seamless Tubing: ASTM B210.

E. Castings: ASTM B26 or B108, alloy 214 unless otherwise recommended by aluminum producer or finisher.

2.03 STAINLESS STEEL

A. Tubing: ASTM A554, grade MT 304 or MT 316.

B. Pipe: ASTM A312, grade TP 304 or TP 316.

C. Castings: ASTM A743, Grade CF 8 or CF 20.

D. Plate: ASTM A167, Type 304.

2.04 FASTENERS

A. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A, with hex nuts, ASTM A563, and flat washers.

B. Machine Screws: ANSI B18.6.3.

C. Lag Bolts: ANSI B18.2.1.

D. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.

E. Plain Washers: Round, carbon steel, ANSI B18.22.1.

F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, determined in accordance with ASTM E448.

2.05 GROUT

A. Non-Shrink Non-Metallic Grout: Euclid Chemical Co. "Euco N-S Grout", L&M Construction Chemicals, Inc. "Crystex", Master Builders Technologies, Inc. "Masterflow 928 and 713" or approved equal.

2.06 PAINT

A. Metal Primer: SSPC 20, Type 2. Exposed to view items to be field painted shall be primed with a primer compatible with final finish coats specified in Section 09 91 00.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel; Rust-Oleum Corp. "Zinc-Rich Cold Galvanizing Compound", Tnemec 90-93, ZRC Worldwide "Galvalite" or approved equal.

2.07 MANUFACTURED ITEMS

A. Abrasive Stair Nosings:

1. Steel Pan Stairs: American Safety Tread Co., Inc. Type 9511, Wooster Products, Inc. "Spectra" Type WP3J or approved equal, color as selected by the County's Representative. Provide contrasting color at top and bottom treads.

2. Cast-in-Place Concrete Stairs: American Safety Tread Co., Inc. Type 3511, Wooster Products, Inc. "Spectra" Type WP3C or approved equal, color as selected by the County's Representative. Provide contrasting color at top and bottom treads.

2.08 FABRICATION, GENERAL

A. Workmanship:

1. Use materials of size and thickness required to produce strength and durability in finished product for use intended.

2. Work to required dimensions,

3. Form exposed work true to line and level with accurate angles and surfaces and straight, sharp edges.

4. Ease exposed edges to a radius of approximately 1/32-inch.

5. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

6. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces. Welds shall be imperceptible in the finished work.

7. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use Phillips flat- head countersunk screws or bolts for exposed fasteners.

8. Cut, reinforce, drill and tap miscellaneous metal work as required to receive finish hardware and similar items.

B. Galvanizing: Provide zinc coating for items specified to be galvanized, as follows:

1. ASTM A153 for galvanizing iron and steel hardware.

2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299-inch thick and heavier.

C. Fabricate joints exposed to the weather to exclude water or provide weep holes.

D. Shop Painting:

1. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces.

2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2, SP-3, or SP-7.

3. Remove oil, grease and similar contaminants in accordance with SP-1.

4. Brush or spray on primer in accordance with manufacturer's instructions, at a rate of 2.0-mils thickness for each coat.

5. Apply one shop coat to fabricated metal items, except apply 2-coats to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish from the first.

7. Primer on exposed to view items to be field painted shall be smooth and suitable for application of final finish coats specified in Section 09 91 00.

8. Apply a heavy coat of bituminous paint, compounded for application in 30-mil coat, to metal surfaces in contact with concrete, masonry and dissimilar metals. Do not apply on exposed surfaces.

2.09 MISCELLANEOUS METAL FABRICATIONS

A. Loose Bearing and Leveling Plates: Provide for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill to receive anchor bolts and for grouting as required. Galvanize after fabrication.

B. Curb Nosings:

1. Fabricate of structural steel shapes of welded construction with mitered corners and continuously welded joints.

2. Provide anchors welded to nosings for embedding in concrete or masonry construction, spaced not more than 6-inches from each curb end, 6-inches from corners and 24-inches on center.

3. Finish: Galvanized.

C. Miscellaneous Framing and Supports:

1. Provide miscellaneous framing and supports not a part of structural steel framework, as required to complete work.

2. Fabricate to sizes, shapes and profiles shown or required.

3. Fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection.

4. Cut, drill and tap units to receive hardware and similar items.

5. Furnish integrally welded anchors for casting into concrete or building into masonry.

6. Finish: Galvanize exterior frames and supports, shop prime interior frames and supports.

D. Steel Tube Railings and Handrails: Maximum member size shall be 1-1/2-inch O.D. Railings and handrails shall comply with ADA requirements.

1. Interconnect railing and handrail members by butt welding or welding with internal connectors.

2. Provide coped joints at tee and cross sections.

3. Form simple and compound curves by bending tubing in jigs to produce uniform curvature for each repetitive configuration. Maintain cylindrical cross-section of tube throughout entire bend without buckling, twisting or deforming exposed surfaces.

4. Provide wall returns at ends of wall-mounted handrails.

5. Close exposed ends of tubing by welding 3/16-inch steel plate in place or by using prefabricated fittings.

6. Flanges, Fittings and Anchors: Provide end closures, flanges, miscellaneous fittings and anchors for interconnections of tubing and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry.

7. Pipe Sleeves:

   a. Provide galvanized pipe sleeves not less than 6-inches long with an inside diameter not less than 1/2-inch greater than the outside diameter of pipe or tube.

   b. Provide steel plate closure welded to bottom of sleeve, width and length not less than 1-inch greater than outside diameter of sleeve.

   c. Provide friction fit, removable covers designed to keep sleeves clean and hold top edge of sleeve 1/2-inch below finished surface of concrete.

8. Finish: Galvanize exterior steel railings, including tubing, fittings, brackets, fasteners, and other ferrous components. Provide black steel tubing for interior railings.

E. Stair Railings and Handrails: Comply with specified requirements for steel tube railings and handrails. Connect railing posts to stair framing by welding. Maximum member size shall be 1-1/2-inch O.D. Railings and handrails shall comply with ADA requirements.

F. Bollards: Fabricate bollards from galvanized steel pipe. Embed in concrete footings, fill with concrete and close top end by welding a 1/4-inch steel plate in place or provide a smooth concrete domed cap.

G. Metal Grilles and Gates Frames:

1. Fabricate from steel tubing and miscellaneous steel shapes. Tubing gauges shall be as recommended by fabricator.

2. Each intermediate vertical member shall be solidly welded to top and bottom rails. Exposed welds shall be ground smooth, flush and imperceptible.

3. Provide hardware required for smooth and easy operation. Reinforce, drill, punch and tap members as required to receive hardware.

4. Finish: Galvanize exterior grilles and gates, including tubing, fittings, brackets, fasteners and other ferrous components.

H. Steel Gratings at Parking Structure Exhaust and Air Intake Areaways:

1. Comply with applicable requirements of National Association of Architectural Metal Manufacturers (NAAMM) "Metal Bar Grating Manual".

2. Type: Welded.

3. Traffic Surface: Striated.

4. Steel Finish: Hot-dip galvanized after fabrication.

5. Notch gratings for penetrations. Layout units to allow removal without disturbing items penetrating grating.

6. Provide banding for openings in grating separated by more than 4-bearing bars, of same material and size as bearing bars.

7. Secure gating units to supporting members by welding where both materials are the same; otherwise, fasten by bolting.

I. Stainless Steel Handrails: Maximum member size shall be 1-1/2-inch O.D. Handrails shall comply with ADA requirements.

1. Interconnect railing and handrail members by butt welding or welding with internal connectors.

2. Provide coped joints at tee and cross sections.

3. Form simple and compound curves by bending pipe or tubing in jigs to produce uniform curvature for each repetitive configuration. Maintain cylindrical cross-section of pipe or tube throughout entire bend without buckling, twisting or deforming exposed surfaces.

4. Provide wall returns at ends of wall-mounted handrails.

5. Close exposed ends of tubing by welding 3/16-inch stainless steel plate in place.

6. Flanges, Fittings and Anchors: Provide end closures, flanges, miscellaneous fittings and anchors for interconnections of handrails and attachment to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry.

7. Finish:

a. Remove or blend tool and die marks and stretch lines into finish.

b. Grind and polish surfaces to produce uniform directional textured polished finish specified, free of cross scratches. Run grain with long dimension of each piece.

1) Bright, Directional Polish: AISI No. 4 finish.

2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

J. Steel Cable Barrier at Parking Structure: Fabricate cable barrier from galvanized steel tube steel posts and 1/2-inch diameter galvanized steel strand aircraft cable with 270-ksi breaking strength. Fabricate to dimensions indicated.

1. Provide closure plate on top of steel posts and bottom plate drilled for anchor bolts as indicated.

2. Welds shall be smooth, flush and imperceptible in the completed work.

3. Space horizontal cables at 4-inches on center and provide strand anchors and other accessories as required for installation and tensioning.

4. Finish: Hot-dip galvanized after fabrication.

K. Welded Steel Grease Duct: Provide custom duct from Kitchen and Servery to roof fan at Penthouse.

1. Fabricate from 16-gauge galvanized steel sheet metal in accordance with SMACNA recommendations.

2. Provide horizontal to vertical transition pieces.

3. Provide fully welded seams between adjacent duct sections. Touch-up abrasions and welds with specified galvanized repair paint.

4. Provide hangers and supports required for supporting and securing ducts in place.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors.

3.02 INSTALLATION

A. General:

1. Fastening to In-Place Construction: Provide threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

2. Cutting, Fitting and Placement:

a. Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications.

b. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

c. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry or similar construction.

3. Fit exposed connections together forming tight hairline joints.

a. Weld connections not shop welded.

b. Grind exposed joints smooth and imperceptible, and touch-up shop paint coat.

c. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and intended for bolted or screwed field connections.

4. Field Welding: Comply with AWS for procedures of manual shielded metal-arc welding, appearance and quality of welds, and methods used in correcting welding work.

5. Install prefabricated items in accordance with manufacturers' instructions.

B. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve surface bond. Clean bottom surface of bearing plates.

2. Set loose leveling and bearing plates on wedges, or other adjustable devices.

3. Tighten anchor bolts after the bearing members have been positioned and plumbed.

4. Cut-off protruding ends of wedges flush with the edge of the bearing plate before packing with grout.

5. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations.

6. Pack grout solidly between bearing surfaces and plates to ensure no voids remain.

C. Gratings: Weld gratings to supporting members or framework.

D. Railings and Handrails:

1. Adjust railings prior to anchoring to ensure matching alignment at abutting joints.

2. Plumb posts in each direction.

3. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts are inserted in sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

4. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.

5. Anchor rail ends into concrete and masonry with round steel flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

6. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members.

7. Secure handrails to wall with wall brackets and end fittings. Secure wall brackets in accordance with manufacturer's instructions.

8. Expansion Joints: Provide at intervals not exceeding 40-feet. Provide slip joint with internal sleeve extending 2-inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6-inches of posts.

E. Gates: Fit hardware accurately and hang gates to operate freely without sticking or binding.

F. Stair Nosings: Install with anchorage complying with manufacturer's recommendations.

G. Bollards: Anchor bollards in concrete with preset pipe sleeves. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solid with non-shrink, nonmetallic grout.

3.03 ADJUST AND CLEAN

A. Touch-Up Painting: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0-mils.

B. Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and spot prime with specified primer applied to a minimum dry film thickness of 2.5-mils.

END OF SECTION