SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Prefabricated building columns.
3. Shelf angles.
4. Metal ladders.
5. Ladder safety cages.
6. Metal floor plate and supports.
7. Structural-steel door frames.
8. Miscellaneous steel trim.
9. Metal bollards.
10. Pipe and Downspout guards.
11. Abrasive metal nosings treads and thresholds.
12. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
1.3 SUBMITTALS

A. Product Data: For the following:
   1. Prefabricated building columns.
   2. Metal nosings and treads.
   3. Paint products.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples: For each type and finish of extruded nosing and tread.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304 or Type 316L.

C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

D. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

E. Abrasive-Surface Floor Plate: Steel plate [with abrasive granules rolled into surface] [or] [with abrasive material metallically bonded to steel].
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. IKG Industries, a division of Harsco Corporation; Mebac.
      b. SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.
      c. <Insert manufacturer's name; product name or designation>.

F. Steel Tubing: ASTM A 500, cold-formed steel tubing.
G. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.3 NONFERROUS METALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.


C. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.


E. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).


2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 or Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
4. Provide bronze fasteners for fastening bronze.

B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

C. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.
2.5 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Shop Primers: Provide primers that comply with [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."] [Section 099600 "High-Performance Coatings."] [Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."]

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.


H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches o.c.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
   1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.8 PREFABRICATED BUILDING COLUMNS

A. General: Provide prefabricated building columns consisting of load-bearing structural-steel members protected by concrete fireproofing encased in an outer non-load-bearing steel shell. Fabricate connections to comply with details shown or as needed to suit type of structure indicated.

B. Fire-Resistance Ratings: Provide prefabricated building columns listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for ratings indicated, based on testing according to ASTM E 119.
   1. Fire-Resistance Rating: As indicated.

2.9 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.10 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3 unless otherwise indicated.
   2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:
   1. Space siderails 18 inches apart unless otherwise indicated.
   2. Space siderails of elevator pit ladders 12 inches apart.
   4. Rungs: 3/4-inch diameter steel bars.
   5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   6. Provide nonslip abrasive surfaces on top of each rung.
   7. Galvanize exterior ladders, including brackets and fasteners.
   8. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer.

C. Aluminum Ladders:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. ACL Industries, Inc.
      b. Alco-Lite Industrial Products.
      c. Halliday Products.
      d. O'Keeffe's Inc.
      e. Precision Ladders, LLC.
      f. Royalite Manufacturing, Inc.
      g. Thompson Fabricating, LLC.
      h. <Insert manufacturer's name>.
   2. Space siderails 18 inches apart unless otherwise indicated.
   3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
   4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
2.11  LADDER SAFETY CAGES

A. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.

B. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.

C. Galvanize steel ladder safety cages, including brackets and fasteners.

D. Prime steel ladder safety cages, including brackets and fasteners, with [zinc-rich primer.][primer specified in Section 099600 "High-Performance Coatings."]

2.12  METAL FLOOR PLATE

A. Fabricate from [rolled-steel floor] [rolled-stainless-steel floor] [rolled-aluminum-alloy tread][abrasive-surface floor] plate.

   1. Thickness: As indicated.

B. Provide angle supports to match ladder materials as indicated.

C. Provide flush or stainless-steel aluminum bar drop handles for lifting removable sections, one at each end of each section.

2.13  STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes fully welded together, with 5/8-by-1-1/2-inch steel channel stops. Plug-weld built-up members and continuously weld exposed joints. Reinforce frames and drill and tap as necessary to accept finish hardware.

   1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Galvanize [exterior ]steel frames.

C. Prime [exterior ]steel frames with [zinc-rich primer.][primer specified in Section 099600 "High-Performance Coatings."]

2.14  MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
C. Galvanize [exterior] miscellaneous steel trim.

D. Prime [exterior] miscellaneous steel trim with [zinc-rich primer.] [primer specified in Section 099600 "High-Performance Coatings."]

2.15 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe steel shapes, as indicated.
   1. Cap bollards with 1/4-inch thick steel plate.

B. Fabricate bollards with 3/8-inch thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.

C. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch thick steel plate welded to bottom of sleeve.

D. Prime bollards with [zinc-rich primer.] [primer specified in Section 099600 "High-Performance Coatings."]

2.16 PIPE GUARDS

A. Fabricate pipe guards from 3/8-inch thick by 12-inch wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

B. Galvanize pipe guards.

C. Prime pipe guards with zinc-rich primer.

2.17 ABRASIVE METAL [NOSINGS, TREADS, AND THRESHOLDS]

A. Cast-Metal Units: Cast [iron] [aluminum] [bronze (leaded red or semired brass)] [nickel silver (leaded nickel bronze)], with an integral-abrasive, as-cast finish.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. American Safety Tread Co., Inc.
      b. Balco Inc.
      c. Barry Pattern & Foundry Co., Inc.
      d. Granite State Casting Co.
      e. Safe-T-Metal Company, Inc.
      f. Wooster Products Inc.
      g. <Insert manufacturer’s name>.

B. Extruded Units: Aluminum, with abrasive filler in an epoxy-resin binder.
1. **Manufacturers:** Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
   
a. ACL Industries, Inc.
b. American Safety Tread Co., Inc.
c. Amstep Products.
d. Armstrong Products, Inc.
e. Balco Inc.
f. Granite State Casting Co.
g. Wooster Products Inc.
h. <Insert manufacturer's name>.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.

3. Provide solid-abrasive-type units without ribs.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c.

E. Apply bituminous paint to concealed surfaces of cast-metal units.

F. Apply clear lacquer to concealed surfaces of extruded units.

2.18 **LOOSE BEARING AND LEVELING PLATES**

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.19 **LOOSE STEEL LINTELS**

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Galvanize loose steel lintels located in exterior walls.

C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.20 **STEEL WELD PLATES AND ANGLES**

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.
2.21 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.22 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning"

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.
D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

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

3.2 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards to existing construction with anchor bolts or through bolts. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.

C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete or in formed or core-drilled holes. Fill annular space around bollard solidly with nonshrink, nonmetallic grout.

D. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

E. Fill bollards solidly with concrete, mounding top surface to shed water.

3.3 INSTALLING BEARING AND LEVELING PLATES


B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

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

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION