SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. See structural drawings for added requirements.

1.2 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Elevator machine beams, hoist beams, and divider beams.
3. Support angles and channels for supporting roof scuttle and roof drains.
4. Loose steel lintels over openings in masonry.
5. Radius arch lintels at tops of glazed curtain walls.
6. Loose bearing and leveling plates.
7. Elevator pit ladders.
8. Support angles for elevator door sills.
9. Steel angle framing for supporting free span solid surface countertops.
10. Steel bollards incorporating card access readers and automatic door push-plates.
11. Wire mesh barrier with swing gate at top landing in Stair No.1.

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

1. Loose steel lintels and radius arch lintels
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel bollards incorporating door access equipment to be installed under Division 08 Section “Door Hardware.”

C. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, rods, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 04 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 05 Section "Structural Steel Framing."
4. Division 05 Section "Metal Stairs."

5. Division 14 Section “Electric Traction Elevators” for machine, hoist and divider beams; elevator pit ladders, and support angles for elevator door sills.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Paint products, including primer and galvanizing repair.
2. Non-shrink grout.

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.
2. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding certificates.

D. Qualification Data: For professional engineer.

1.5 COORDINATION

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

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

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

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

D. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMFA-3.

1. Size of Channels: 1 5/8 by 1 5/8 inches (41 by 41 mm).
2. Material: Galvanized steel complying with ASTM A 525/526, commercial steel, low carbon, cold rolled, ANSI/ASTM A 366; 0.108 inch (2.8 mm) nominal thickness.

2.3 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

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

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1) 2 (A4).

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

H. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

I. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

J. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; 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, hot-dip galvanized per ASTM A 153/A 153M.

K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Master Painters Institute (MPI) standards for metal substrates specified in Division 9 Sections “Interior Painting” and “Exterior Painting.”

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

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

E. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" and structural drawings for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

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

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. 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 so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

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 retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Prime miscellaneous framing and supports with one of specified metal primers.

2.8 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. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm), unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. See structural drawings for added requirements.

2.9 RADIUS ARCH LINTELS

A. Fabricate radiused lintels from steel plate torch cut and bent to required radius for supporting arch brick around semi-circular top of glazed curtain walls.

1. See Structural Drawings for details.

B. Hop dip galvanize arch lintels after completing welded fabrication.

2.10 SHELF ANGLES

A. Fabricate shelf angles form steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive ¾ inch (19 mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

2.11 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.

B. Prime plates with specified zinc-rich primer.

2.12 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 not less than two integrally welded steel strap anchors for embedding in concrete.

2.13 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1 and the Maryland Elevator Code.
3. Space siderails 18 inches (457 mm) apart, unless otherwise indicated.
4. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted brackets, made from same metal as ladder.

B. Steel Ladders:

1. Siderails: Continuous 3/8 inch by 2-1/2 inch (9.5 by 64 mm) steel flat bars, with eased edges.
2. Rungs: 3/4 inch (19 mm) diameter steel bars.
3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
4. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
5. Available Products:

    a. IKG Industries, A Harsco Company; Mebac.
    b. W. S. Molnar Company; SlipNOT.

6. Galvanize ladders including brackets and fasteners.

2.14 BOLLARDS INCORPORATING DOOR ACCESS EQUIPMENT

A. Fabricate bollards from Schedule 40 steel pipe and weld to circular steel plate for mounting on finished pavement.

1. Bollard Diameter: 6 inches.
2. Bollard Height: 42 inches.

3. Bollard Cap: 1-1/4 inch (6.4mm) thick steel plate, sloped at 45 degrees; circular door operator push-plate to be mounted on sloped plane.

4. Base Plate: 3/8 inch (9.5 mm) thick steel base plate for bolting to concrete slab. Drill base plate at all 4 corners for 3/4" inch (19 mm) anchor bolts.

5. Mounting Height for Card Reader: 30 inches to center of pad; factory formed and finished rectangular recess for field installing card reader module.

B. Fabricate Source:

1. Cal Pipe Security Bollards, Division of Cal Pipe Manufacturing Co.

a. Manufacturer's base-plate mounted utility bollard.

b. Finish: prime painted and powder coated; color to be specified by Architect from among manufacturer's standard color palette.

2.15 WIRE MESH BARRIERS WITH SWING GATE

A. Fabricate wire mesh items from components of sizes not less than those indicated below. Use larger-sized components as required to achieve stability in field completed assembly. Provide all bolts, hardware, and accessories required for a complete installation, in manufacturer's standard finishes.

1. Welding: Weld corner joints of framing and grind smooth.

B. Mesh: 0.135-inch- (3.5-mm) diameter, intermediate-crimp steel wire woven into 1-1/2 inch (38-mm) diamond mesh.

C. Panels: 1-1/4-by-1-1/4-b1-1/8-inch (32-by-32-by32-mm) steel angle framing on 4 sides, with wire mesh welded to framing.

1. Horizontal Panel Stiffeners: 1-1/4-by-1-1/4-by-1-1/8-inch (32-byh-32-by-3-mm) steel angles or 3/4-by-1/4-inch (19-by-6-mm) hot-rolled steel flat bars.

2. Height: 84 inches (2-3/4 mm).

D. Line and Corner Posts: 2-by-2-by-0.068-inch (50-by-50-by-1.7-mm) steel tubing with steel base plates welded to bottoms, drilled for attachment to floor, and with steel caps welded to tops.

1. Height: Panel height plus 12-inch- (300-mm) high, sweep space.

E. Swinging Gate: Fabricated from same mesh as panels, with gate framing fabricated from 1-1/4-by-1-1/4-by-3/16-inch (32-by-32-by-4.7-mm) steel angles on 4 sides, and with wire mesh welded to framing.

1. Hinges: full-surface type, 3-1/2-by-3-1/2-inch (89-by-89-mm) steel, 1 pair per door; bolted, riveted, or welded to door and jamb framing.

2. Padlock Lug: Mortised into door framing and enclosed with steel cover.

F. Finish for Uncoated Ferrous Steel: Shop prime for field painting.

1. Color: To be selected by Architect.

2.16 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.

2.17 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements described in the Society for Protective Coatings specification, SSPC-SPCOM for proper surface preparation of installed metal fabrications based on environmental exposure conditions.

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

2.18 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

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 so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

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

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

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

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove

wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use Nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use Nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.

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

3.4 INSTALLING WIRE MESH BARRIER AND SWING GATE

A. Anchor wire mesh partition and swing gate frame to floor and adjacent wall with 3/8-inch- (9.5-mm-) diameter, expansion anchors through post bases. Shim post bases as required to achieve level and plumb installation.

B. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

C. Install gate complete with gate hardware.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

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

END OF SECTION 05500