

SECTION 05 50 00

MISCELLANEOUS METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements including but not limited to:

1. Steel framing and supports for:
 - a. Overhead doors.
 - b. Countertops.
 - c. Mechanical and electrical equipment.
 - d. Applications where framing and supports not specified elsewhere.
 - e. Miscellaneous framing and supports.
2. Steel tube reinforcement for low partitions.
3. Support angles for elevator door sills.
4. Elevator pit sump covers.
5. Elevator beams, angle and channel shapes, related metal members and anchors.
6. Steel shapes for supporting elevator door sills.
7. Shelf angles.
8. Metal ladders.
9. Metal ships' ladders and pipe crossovers.
10. Metal floor plate and supports.
11. Miscellaneous steel trim including steel angle guards, steel edgings, and loading dock edge angles.
12. Metal bollards.
13. Pipe and downspout guards.
14. Abrasive metal nosings, treads, and thresholds.
15. Metal downspout boots.
16. Loose bearing and leveling plates.
17. Loose steel lintels.
18. Anchor bolts, steel pipe sleeves, slotted channel inserts, and wedge type inserts indicated to be cast into concrete or built into unit masonry.
19. Steel weld plates and angles for casting into concrete for applications.
20. Metal security grates and frames.

1.2 ACTION SUBMITTALS

- A. Product Data: Submit technical data for each miscellaneous metal fabrications and paint, coatings, and grout accessories.

- B. Shop Drawings: Submit shop drawings detailing the fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
1. For installed products indicated to comply with design loads, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Steel framing and supports for overhead doors.
 3. Steel framing and supports for countertops.
 4. Steel tube reinforcement for low partitions.
 5. Steel framing and supports for mechanical and electrical equipment.
 6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 7. Elevator beams, angle and channel shapes, related metal members and anchors.
 8. Steel shapes for supporting elevator door sills.
 9. Shelf angles.
 10. Metal ladders.
 11. Metal ships' ladders and pipe crossovers.
 12. Metal floor plate and supports.
 13. Miscellaneous steel trim including angle guards steel edgings and loading dock edge angles.
 14. Metal bollards.
 15. Loose steel lintels.
 16. Expanded Metal security gratings, frames, anchorages and fabrication.
- C. Delegated Design Submittal: Submit for products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. [Ladders] [and] [Alternating Tread Devices]: Provide [ladders] [and] [alternating tread devices], capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

1.3 INFORMATIONAL SUBMITTALS

- A. Certificates and Reports:
1. Welding certificates.
 2. Mill certificates.
 3. Paint Compatibility Certificates: Submit manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
 4. Research/Evaluation Reports: ICC-ES reports for post installed anchors.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:

1. Welding: Qualify procedures and personnel according to the following:
 - a. AWS D1.1/D1.1M Structural Welding Code - Steel.
 - b. AWS D1.2/D1.2 M Structural Welding Code - Aluminum.
 - c. AWS D1.6/D1.6M Structural Welding Code - Sheet Steel.
 - d. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
 - B. Fabricator/Installer Qualifications: A firm having minimum 5 years documented experience in producing metal fabrications similar to those indicated.
 - C. Professional Engineer Qualifications: A professional engineer legally qualified to practice in jurisdiction is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated in material, design, and extent.
- 1.5 COORDINATION
- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
 - B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.
- 1.6 FIELD CONDITIONS
- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
 1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 2. Provide allowance for trimming and fitting at site.
- 1.7 STORAGE, DELIVERY AND HANDLING
- A. Store metal fabrications in a dry, well ventilated, weathertight place. Deliver and handle to prevent type of damage to the fabricated work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design ladders , including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B.
- C. Structural Performance of Safety Posts for Fixed Ladders:
 - 1. Support Load: 200 pounds (9.58 kN).
- D. Structural Performance of Countertops and Vanities:
 - 1. Countertops and Vanities: Provide countertop and vanity framing capable of withstanding the structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections, or of exhibiting excessive deflections in any of the components making up the countertops and vanities:
 - a. All deadloads.
 - b. 500 pound live load placed on the countertop and vanity.
 - c. Deflection at Midspan: L/1000 times span or 1/8 inch whichever is less.
- E. 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 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

2.2 MATERIALS

- A. Metal Surfaces: 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.
- B. Ferrous Metal:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Stainless Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
 - 3. Stainless Steel Bars and Shapes: ASTM A 276, Type 304.
 - 4. 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.
 - 5. Rolled Stainless Steel Floor Plate: ASTM A 793.

6. Abrasive Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallurgically bonded to base metal.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) IKG Industries, a division of Harsco Corporation.
 - 2) SlipNOT Metal Safety Flooring; W.S. Molnar Company.
 7. Steel Tubing: ASTM A 500/A 500M, cold formed steel tubing.
 8. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
 9. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- C. Nonferrous Metal:
1. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
 2. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
 3. Aluminum Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
 4. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- D. Fasteners: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless steel fasteners for fastening aluminum.
 2. Provide stainless steel fasteners for fastening stainless steel.
 3. Provide stainless steel fasteners for fastening nickel silver.
 4. 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.
 5. Steel Bolts and Nuts: Regular hexagon head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
 6. Stainless Steel Bolts and Nuts: Regular hexagon head annealed stainless steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).
 7. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
 - a. Hot dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
 8. Anchors: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
 9. 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.

10. Post Installed Anchors: chemical anchors.
 - a. Material for Interior Locations: Carbon steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
 - b. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

E. Miscellaneous Materials:

1. Shop Primer for Ferrous Metal: Universal primer, organic zinc rich primer, complying with SSPC-Paint 20 and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc rich primer.
 - a. Product: Provide Series 10-99 (red) or 10-09 (gray) by Tnemec Company.
2. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc coated metal and compatible with finish paint systems indicated.
3. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - a. Product: Provide Series 90-97 Tneme-Zinc by Tnemec Company.
4. Bituminous Paint: Cold applied asphalt emulsion complying with SSPC-Paint 12, containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D 1187 ASTM D 1187/D 1187M.
5. Nonshrink, Nonmetallic Grout: Factory packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
6. Concrete Materials and Properties: Composed of ASTM C150 Type I Portland cement, ASTM C33 sand and coarse aggregates and potable water to produce a low slump mix suitable for placement. Grade coarse aggregate from 1/8 inch (3 mm) with at least 95 percent passing a 3/8" sieve and not more than 10 percent passing a No. 8 sieve. Proportion fill to provide a minimum 28 day compressive strength of 3000 psi (20 MPa).

- F. Concrete Materials and Properties: Composed of ASTM C150 Type I Portland cement, ASTM C33 sand and coarse aggregates and potable water to produce a low slump mix suitable for placement. Grade coarse aggregate from 1/8 inch (3 mm) with at least 95 % passing a 3/8 inch (9 mm) sieve and not more than 10% passing a No. 8 sieve. Proportion fill to provide a minimum 28 day compressive strength of 3000 psi (20 MPa).

2.3 FABRICATION

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

1. 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.
2. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
3. Form exposed work with accurate angles and surfaces and straight edges.
4. Weld corners and seams continuously to comply with the following:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove welding flux immediately.
 - d. 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.
5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
6. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
7. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
8. 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.
9. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 inch by 1-1/2 inches (3.2 mm by 38 mm), with 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.

2.4 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Pipe and Parapet Rooftop Crossovers: Refer to Section 07 72 00 Roof Accessories.
- B. Provide steel framing and supports necessary to complete the work and which are not a part of the structural framework, including but not limited to framing and supports for elevator hoistway beams, elevator sills, overhead lobby door frames, sliding doors, countertop and vanities, ceiling hung toilet compartments, and tube framing for partial height walls, CMU partition head supports, mechanical and electrical equipment.
 1. 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. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - a. Fabricate units from slotted channel framing where indicated.
 - b. Furnish inserts for units installed after concrete is placed.

- C. Countertop and Vanity Framing: Custom fabricate countertop and vanity framing, using steel shapes and plates, and cold finished mild steel bars at exposed conditions, for support framing and plywood, to the thickness, sizes and shapes shown, and necessary to produce work of adequate strength and durability, without objectionable deflections. Use proven details of fabrication, as required, to achieve proper assembly and alignment of the various components of the work.
- D. CMU Partition Head Supports: Fabricate supports from 4" x 4" x 1/4" x 36" (100 mm by 100 mm by 6 mm by 900 mm) long structural steel angles. Drill supports a maximum of 12 inches (300 mm) o.c. to receive expansion bolts.
 - 1. Galvanize miscellaneous framing and supports at exterior locations; prime paint miscellaneous framing and supports at interior locations.
 - 2. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches (600 mm) o.c.

2.5 METAL ANGLES AND PLATES

- A. Angles: Fabricate angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4 inch (19 mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
 - 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.
 - 3. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
 - a. Galvanize and prime all angles located in exterior walls.
 - b. Prime shelf angles located in exterior walls with zinc rich primer.
 - c. Furnish wedge type concrete inserts, complete with fasteners, to attach shelf angles to cast in place concrete.
- B. Loose Bearing and Leveling Plate: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
 - 1. Galvanize plates.
- C. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
 - 1. 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.
 - 2. Galvanize and prime loose steel lintels located in exterior walls.
- D. Steel Weld Plates and Angles: Provide steel weld plates and angles not specified elsewhere for items supported from concrete construction as necessary to complete the work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.6 FIXED LADDERS

A. Regulatory Requirements:

1. Comply with ANSI A14.3 for elevator pit ladders, comply with ASME A17.1/CSA B44.
2. Comply with OSHA 1910 Series Walking-Working Surfaces and Fall Protection Standards.
3. Comply with OSHA 1910.66 for fall protection.
4. Comply with OSHA 1910.28 for fixed ladders.

B. Steel Ladders:

1. Space siderails 16 inches (406 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 3/8 inch by 2-1/2 inch (9.5 mm by 64 mm) steel flat bars, with eased edges.
3. Rungs: 3/4 inch (19 mm) diameter steel bars.
 - a. Fit rungs in centerline of siderails; plug weld and grind smooth on outer rail faces.
 - b. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum oxide granules set in epoxy resin adhesive or by using a type of manufactured rung filled with aluminum oxide grout.
 - c. Provide nonslip surfaces on top of each rung by coating with abrasive material metallurgically bonded to rung.
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a) Harsco Industrial IKG, a division of Harsco Corporation.
 - b) SlipNOT Metal Safety Flooring; W.S. Molnar Company.
4. Stand Off Brackets: Sized to permit minimum 7 inches (175 mm) clear distance from the midpoint of the ladder rung to the nearest permanent object in back of the ladder.
 - a. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
5. Platform: Provide platforms as indicated fabricated from welded or pressure locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
6. Ladder Security Door: Provide minimum 72 inch (1830 mm) high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.
7. Galvanize and prime exterior ladders, including brackets.

C. Ship's Ladders and Pipe Parapet Rooftop Crossovers: Metal ships' ladders and pipe parapet crossovers where indicated. Fabricate of open type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.

1. Manufacturer: Subject to compliance with requirements, provide LadSaf by DIA-SALA or comparable by one of the following:
 - a. Diversified Fall Protection.
 - b. Guardian Fall Protection.

- c. Honeywell Miller, Honeywell Industrial Safety.
 2. Fabricate ships' ladders and crossovers, including railings and platform from steel.
 3. Treads: Minimum 5 inches (127 mm) exclusive of nosing or less than 8-1/2 inches (216 mm) including the nosing, with maximum riser height of 9-1/2 inches (241 mm).
 - a. Fabricate treads and platforms from rolled steel floor plate color selected by Architect.
 4. Platforms: Provide platforms fabricated from pressure locked aluminum bar grating or extruded aluminum plank grating, supported by extruded aluminum framing. Limit openings in gratings to no more than 3/4 inch (19 mm) in least dimension.
 5. Galvanize and prime steel ships' ladders, including treads, railings, brackets, and fasteners.
- D. Fixed Ladder Safety System: Sleeve with carabiner, dual independent blocking system, fitting 3/8 inch (9 mm) and 5/16 inch (8 mm) diameter 1x7 or 7x19 solid core cable.
 1. Manufacturer: Subject to compliance with requirements, provide Model 61600030B LadSaf X2 Detachable Cable Sleeve by DIA-SALA.
- E. Fixed Ladder Grab Bar Extension: Three foot (1 m) steel extension arm fabricated to slide over each ladder side rail, locking into place at top rung.
 1. Manufacturer: Subject to compliance with requirements, provide one of the following:
 - a. Safe-T Ladder Extension by Guardian Fall Protection.
 - b. EX-25-A-2-B-1-C by Diversified Fall Protection.
- F. [Ladder Safety Posts: Telescoping ladder safety post for fixed ladders below roof and floor hatch covers. Fabricate from aluminum high strength square tubing, 1-1/2 inch by 1-1/2 inch by 1/8 inch (38 mm by 38 mm by 3 mm) with pull up loop at the upper end to facilitate raising of post; mounting to top two ladder rungs.
 1. Basis of Design: LadderUp Safety Post by Bilco Company: Subject to compliance with requirements, provide basis of design or comparable products by one of the following:
 - a. Bilco Company.
 - b. Babcock Davis.
 - c. Nystrom
 2. Finish: Hot dipped galvanized steel Powder coated, safety yellow.
 3. Spring Assist: Stainless steel balancing spring mechanism.
 4. Provide fasteners, fittings, mounting hardware, and accessories necessary for a complete installation.

2.7 FALL PROTECTION

- A. Refer to Section 11 24 29 where applicable.

2.8 METAL FLOOR PLATE AND HATCH

- A. Floor Plate: Fabricate from rolled steel floor plate with abrasive surface of thickness indicated:
 - 1. Thickness: 3/16 inch (4.8 mm) or as indicated on the Drawings.
 - 2. Provide grating sections where indicated fabricated from pressure locked steel, galvanized bar grating. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
 - 3. Provide steel angle supports as indicated.
 - a. Include steel angle stiffeners, and fixed and removable sections as indicated.
 - 4. Provide flush stainless steel bar drop handles for lifting removable sections, one at each end of each section.

- B. Floor Hatch: Where indicated Provide single leaf aluminum plate floor hatch.
 - 1. Size: As indicated on the Drawings.
 - 2. Frame: 1/4 inch (6 mm) extruded aluminum with built in neoprene cushion, with strap anchors bolted to exterior.
 - 3. Door: 1/4 inch (6 mm) aluminum diamond plate reinforced with aluminum stiffeners as required. Bolt cast steel hinges to underside and pivot on torsion bars. Fabricate door to open to 90 degrees and lock automatically in position. Provide vinyl grip handle. Construct door withstand minimum live load of 150 lbs. per sq. ft.
 - 4. Factory finish: Aluminum lacquer, and a bituminous coating applied to exterior of the frame.

2.9 ELEVATOR ACCESSORIES

- A. Elevator Pit Sump Covers: Fabricate from 3/16 inch (4.8 mm) rolled steel floor plate with four 1 inch (25 mm) diameter holes for water drainage and for lifting.
 - 1. Provide steel angle supports as indicated.

- B. Elevator Beams and Guide Rails and Support members: Steel beam sections, prime painted, sized and dimensioned to comply with elevator manufacture requirements and to sustain loads and force imposed by operation of elevator.

- C. Elevator Sill: Fabricated from aluminum, grooved, extending full width of door travel.

2.10 MISCELLANEOUS STEEL TRIM

- A. Steel Trim: Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
 - 1. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - a. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c.

2. Cast in Pit Angles and Edge Angles: Provide edge angles, and pit angles, fabricated from angles of size as shown, or required, with welded on stud anchors spaced 24 inches (600 mm) on center. Provide pit and edge angles in as long lengths as possible. Miter and weld corners and provide splice plates for alignment between sections.
3. Galvanize miscellaneous steel trim.

2.11 PIPE BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe 1/4 inch (6.4 mm) wall thickness steel tubing size as indicated on the Drawings.
 1. Where indicated. cap bollards with 1/4 inch (6.4 mm) thick, steel plate with flat top.
 2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
 3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
 4. Where surface mounting is indicated, fabricate bollards with 3/8 inch (9.5 mm) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4 inch (19 mm) anchor bolts.
 - a. Where bollards are anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
 5. Where full embedment anchorage is indicated, extend bollard piping without seams into foundation and cast in place. Extend bollard into concrete to dimensions indicated on the Drawings but in now case less than 24 inches full embedment.
- B. Fabricate internal sleeves for removable bollards from Schedule 80 stainless steel pipe or 1/4 inch (6.4 mm) wall thickness stainless steel tubing with an OD approximately 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 3/4 inch (19 mm) stainless steel machine bolt.
 1. Prime bollards with zinc rich primer.

2.12 EXPANDED METAL SECURITY GRATINGS

- A. Provide expanded metal gratings in material, finish, style, size, thickness, weight, and type indicated for security applications, above ceilings, below raised access floors, to close off interstitial spaces from through access and where security gratings are indicated in the Drawings.
 1. ASTM F1267-18 Type II, expanded and flattened, Class 2 Hot Dipped Zinc Coated, Grade A minimum 0.0025 inch coating thickness with the following properties:
 - a. Material: Steel.
 - b. Steel Finish: Hot dipped galvanized and shop painted.
 - c. Style Designation: 3/4 number 9F Heavy, Super maximum Security.
 - 1) Acceptable Product: AMICO; ASM 0.75-9F HEAVY, Super Maximum Security.

- B. Frames and Supports for Metal Security Gratings: Fabricate from metal channels of welded construction to sizes, shapes, and profiles necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive anchors and hardware.
 - 1. Unless otherwise indicated, fabricate from same basic metal as gratings.
 - 2. Provide steel u-channel binding frames at edges of security gratings and around all openings, meeting the following minimum parameters:
 - a. Steel Thickness: 3/32 inch minimum.
 - b. Channel depth: 1 inch minimum.
 - c. Channel throat width: Sized for security grating overall thickness and anchorage in frame.
 - d. Finish: To match expanded metal security gratings.
 - 3. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.
 - 4. Galvanize all steel frames and supports prior to finishing.
- C. Anchors for Expanded Metal Security Gratings: Provide button head tamper resistant anchors suitable for the substrate into which security gratings are secured with a minimum of 1 inch penetration into substrate and having a minimum pullout strength of 200 pounds.

2.13 EXPANDED METAL SECURITY GRATING FABRICATION

- A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- B. Form from materials of size, thickness, and shapes indicated, but not less than minimum sizes indicated
- C. Fit exposed connections accurately together to form hairline joints.
- D. Welding: Comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchors to secure gratings, frames, and supports rigidly in place and to support indicated loads, but no greater than 12 inches on center.
- F. Fabricate cutouts in grating sections for penetrations of sizes and at locations indicated. Cut openings neatly and accurately to size. Provide channel binding frames at all openings greater than 4 inches.

- G. For openings less than 4 inches where gratings are pierced by pipes or other members, cut openings neatly and accurately to size and weld a strap collar not less than 1/8 inch (3 mm) thick to the cut ends. Divide panels into sections only to the extent required for installation where grating must be placed around previously installed pipe, ducts, and structural members.

2.14 STAIR NOSINGS

- A. Abrasive Metal Nosings or Treads as indicated:
 - 1. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) American Safety Tread Co., Inc.
 - 2) Armstrong Products, Inc.
 - 3) Wooster Products Inc.
 - b. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
 - c. Provide solid abrasive type units without ribs.
 - d. Nosings: Square back units, 3 inches (75 mm) wide, for casting into concrete steps.
 - e. Treads: Square back units, full depth of tread with 1-3/8 inch (35 mm) lip, for application over existing stairs.
 - 2. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
 - 3. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
 - a. Provide two rows of holes for units more than 5 inches (125 mm) wide, with two holes aligned at ends and intermediate holes staggered.
 - 4. Apply bituminous paint to concealed surfaces of cast metal units.
 - 5. Apply clear lacquer to concealed surfaces of extruded units.

2.15 DOWNSPOUT ACCESSORIES

- A. Downspout Boot: Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts and connection applications. Provide units with flanges and holes for countersunk anchor bolts.
 - 1. Outlet: Provide outlets to suit applications including but not limited to Vertical, to discharge into pipe Horizontal, to discharge into pipe At 35 degrees from horizontal, to discharge onto splash block or pavement as indicated or clarified by Architect.
 - 2. Prime cast iron downspout boots with zinc rich primer.

2.16 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch (3mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5mm).
- D. Maximum Bow: 1/8 inch (3mm) in 48 inches (1.2m).
- E. Maximum Deviation From Plane: 1/16 inch (1.5mm) in 48 inches (1.2m).

2.17 FINISH

- A. Finish metal fabrications after assembly. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
- B. Steel and Iron Finishes:
 - 1. 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.
 - a. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
 - 3. 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.
 - 4. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
 - a. Exterior Items: SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning.
 - b. Items Indicated to Receive Zinc Rich Primer: SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning.
 - c. Items Indicated to receive primers specified for high performance Coatings: SSPC-SP 6/NACE No. 3 "Commercial Blast Cleaning.
 - d. Other Items: SSPC-SP 3"Power Tool Cleaning.
 - 5. 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.
 - 6. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- C. Stainless Steel Finishes: Remove tool and die marks and stretch lines or blend into finish.
 - 1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 - 2. Bright, Directional Polish: No. 4 finish.

3. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- D. Aluminum Finishes:
1. As Fabricated (Mill) Finish: AA-M12.
 2. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.
 - a. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.

- G. Framing and Supports: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
1. Anchor supports for all items securely to, and rigidly brace from, building structure.
 - a. CMU Partition Head Supports: Unless otherwise indicated place partition head supports on alternate faces of CMU partitions every 6 feet o.c. and expansion bolt to underside of structure. Do not bolt to CMU partitions.
- H. Metal Bollards: Set bollard in true vertical position to mounting conditions as noted.
1. On Grade Minimum Requirements: Unless otherwise noted on the Drawings Provide 4 inch diameter heavy weight pipe 6'0" with 12" x 12" sill plate bottom for 2'0" embedment into 1'0" diameter by 2'3" concrete footing. Fill with 2,000 psi concrete, domed to shed water.
 2. Elevated Slab Minimum Requirements: Unless otherwise noted on the Drawings Provide 4 inch diameter heavy weight steel pipe for welding to 6" x 6" x 1/4" thick steel plate with four 3 inch studs 1/2 inch from each corner with 12 inch #4 rebar welded each way.
 3. Fill metal capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 - a. Do not fill removable bollards with concrete.
 4. Where surface mounting is indicated, anchor bollards to existing construction with anchor bolts. Provide four 3/4 inch (19 mm) bolts at each bollard unless otherwise indicated.
 - a. Embed anchor bolts at least 4 inches (100 mm) in concrete.
 5. Where full embedment with pipe sleeves is indicated, anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.
 6. Where direct full embedment is indicated, anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
 7. Where removable bollards are indicated, anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.
 - a. Place removable bollards over internal sleeves and secure with 3/4-inch (19-mm) machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.
 8. Fill bollards solidly with concrete, mounding top surface to shed water.
 - a. Do not fill removable bollards with concrete.
- I. Nosings, Treads, and Thresholds: Center nosings on tread widths unless otherwise indicated.
1. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

2. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 07 92 00 to provide a watertight installation.
- J. Leveling Plate: Clean concrete and masonry bearing surfaces of bond reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.
1. 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 nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.1 INSTALLING METAL SECURITY GRATINGS

- A. Place units with straight edge of bond up and with long direction of diamond-shaped openings parallel to direction of span.
- B. Attach removable units to supporting members by bolting at 12-inch (300-mm) intervals maximum.
- C. Attach nonremovable units to supporting members by welding unless otherwise indicated. Space welds at 6-inch (150-mm) intervals.
- D. Butt edges parallel to long direction of diamond-shaped openings and weld at every second bond point. Place individual grating sections so diamonds of one piece are aligned with those of adjacent sections.

3.2 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch (6mm) per story, noncumulative.
- B. Maximum Offset from True Alignment: 1/4 inch (6mm).
- C. Maximum Out of Position: 1/4 inch (6mm).

3.3 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 the Division 9 Sections governing the appropriate paints and coatings systems of each component assembly.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION