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**SECTION 05 50 00**  
**MISCELLANEOUS METALS****PART 1 GENERAL****1.1 DESCRIPTION**

- A. Scope:
  - 1. Furnish labor, materials, tools, equipment, services, supervision required to complete miscellaneous metalwork including all incidental and complementary work shown, specified, or necessary to complete work as indicated.
  - 2. No attempt is made to enumerate each item required, but to indicate parts and describe general construction and certain special items; perform work in strict conformity with the Contract Drawings, approved Shop Drawings, and the Specifications; obtain field measurements of adjoining work required to locate and fit work.
- B. Related Work specified elsewhere:
  - 1. Section 03 30 00 - Cast-In-Place Concrete.
  - 2. Section 03 60 00 - Grout.
  - 3. Section 07 92 00 - Joint Sealants.
  - 4. Section 09 90 00 - Painting.

**1.2 QUALITY ASSURANCE**

- A. Standards:
  - 1. American Society for Testing and Materials (ASTM):
    - a. ASTM A27 - Steel Castings, Carbon, for General Application
    - b. ASTM A36 - Carbon Structural Steel
    - c. ASTM A48 - Gray iron Castings
    - d. ASTM A53 - Pipe Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
    - e. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
    - f. ASTM A193 - Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
    - g. ASTM A194 - Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
    - h. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates
    - i. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
    - j. ASTM A325 - High-Strength Bolts for Structural Steel Joints
    - k. ASTM A490 - Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
    - l. ASTM A507 - Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, Drawing Quality
    - m. ASTM A568 - Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements
    - n. ASTM A1008 - Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent) Cold-Rolled, High Strength Low Alloy
    - o. ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs
    - p. ASTM F1554 - Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength
  - 2. American Institute of Steel Construction (AISC)
  - 3. American Welding Society (AWS)
  - 4. OSHA Standards

5. Steel Structures Painting Council (SSPC)
- B. Welder, Welding Operator and Tacker Qualifications: Each welder, welding operator and tacker shall be qualified in accordance with the applicable requirements of AWS D1.1.

### **1.3 SUBMITTALS**

- A. General: Submit in accordance with Section 01 30 00.
- B. Shop Drawings (Miscellaneous Steel Fabrications, Pipe Bollards, and Anchor Bolts):
  1. Submit complete, detailed shop and erection drawings of all work for approval before starting fabrication and installation of materials.
  2. Show details of construction and placement including hardware, fittings and fastenings, anchorages, types and gauges of metals being used.
- C. Design Drawings (Handrail Systems and Vertical Ladders):
  1. Prior to fabrication, manufacturer shall submit design and erection drawings.
  2. Design drawings shall bear the seal and signature of a Professional Engineer registered in the state in which the Project is located.
- D. Welder Qualifications: Submit evidence of qualifications for welders, welding operators and tackers.

### **1.4 PRODUCT DELIVERY, HANDLING AND STORAGE**

- A. Deliver all materials in good condition. Store in dry place, off ground; keep dry at all times. Handle materials to prevent damage to product or structure.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. General: Metals free from defects impairing strength, durability and appearance; best commercial quality for purposes specified, structural properties to safely withstand strains and stresses to which subjected.
- B. Steel Materials:
  1. Structural Steel: ASTM A283 or A36, as applicable.
  2. Cold Finished Steel: Mild steel, rolled, drawn, ASTM A568.
  3. Steel Pipe: Black and Galvanized, Standard Weight, Schedule 40 and Schedule 80, ASTM A53 as indicated on the Contract Drawings.
  4. Steel Bolts, Nuts, Washers: ASTM A307, Grade A, general use, Grade B, flanges, galvanized in accordance with ASTM A153.
  5. High Tension Bolts: ASTM A325 (Type 3 for corrosive locations).
  6. Galvanized Guard Chain: Carbon steel proof coil chain, 3/8" trade size, electric welded, minimum 1700 pound work load limit, ASTM A413, hot dipped galvanized in accordance with ASTM A153.
  7. Anchor Bolts: Stainless steel, ASTM F593 or as indicated on the Contract Drawings.

### **2.2 STEEL SHOP PRIMER**

- A. Preparation: SSPC SP-2 and SP-1.
- B. Acceptable Primers:
  1. Rust Inhibitive Alkyd Resin; VOC content of unthinned product shall not exceed 2.8 lbs./gallon.
  2. Product shall be Series 88 HS Azeron H.S. Primer as produced by Tnemec Company or equal product of Sherwin-Williams, Southern Coatings, Glidden, Rust-Oleum Corp. or Con-Lux.
- C. Application:

1. Apply with spray only for metal fabrications exposed to public view.
2. Apply primer free of runs and other irregularities that may require modification to achieve the specified finish appearance.
3. Provide a minimum dry film thickness of 2 mils per coat.

## **2.3 FABRICATION**

- A. General:
  1. Form and finish metalwork to shape and size with sharp angles and lines.
  2. Metalwork that becomes bent by shearing or punching may be straightened and used if approved by the (Engineer) (Architect).
  3. Grind exposed edges of work smooth; construct joints exposed to weather to exclude water.
- B. Hardware:
  1. Countersink metalwork to receive the required hardware and to provide the proper bevels and clearances.
  2. Provide welded backup plates for mounting hardware; drill or punch holes for bolts and screws; conceal fastenings wherever practicable.
  3. Provide brackets, lugs, and similar accessories required for installation as a part of the metal item.
- C. Shop and Field Welding:
  1. In accordance with recommendations of American Welding Society (AWS) Standard D1.
  2. Welds solid and homogeneously a part of metals joined for full area indicated or necessary to develop required strength of joint.
  3. Welds free from pits or incorporated slag or scale; surfaces of welds smooth and regular.
- D. Workmanship Class 1:
  1. Exposed Surfaces: Sandblast surfaces smooth with pits, mill marks, nicks and scratches filled or ground off. Defects shall not show when painted.
  2. Welds: Conceal welds where possible. Where exposed, grind welds to small radius with uniform sized cove. When painted, welds shall be undetectable.
  3. Bolts: Use only flat head countersunk bolts in exposed locations.
  4. Straightness: Distortions visible to the eye will be rejected.
  5. Joints: Fit joints to hairline finish.
- E. Workmanship Class 2:
  1. Exposed Surfaces: Moderate irregularities not visible at 30' may remain. Mill marks may remain.
  2. Welds: Grind welds to small radius with uniform sized cove.
  3. Bolts: Use only flat or oval head countersunk bolts where exposed to view.
  4. Straightness: Minor distortions will be permitted.
  5. Joints: Provide maximum gap of 1/16".
- F. Workmanship Class 3:
  1. Exposed Surfaces: No improvement from mill finish required except preparation for galvanizing or priming.
  2. Welds: Grinding not required.
  3. Bolts: Exposed bolts permitted.

## **2.4 PIPE RAILINGS**

- A. Railing:
  1. Steel:

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- a. Guard Rails: Nominal 1-1/2" diameter, Schedule 40, galvanized steel pipe.
  - b. Hand Rails: Nominal 1-1/4" inside diameter, Schedule 40, galvanized steel pipe.
  - B. Railing systems shall be designed to meet OSHA, and IBC standards. Refer to Drawings for railing system details.
  - C. Post spacing shall be adequate to meet loading requirements but shall not exceed 6'-0" o.c. maximum.
  - D. All connections for fixed railing systems shall be continuously fillet welded and ground smooth.
  - E. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations. The top surface of the top railing shall be smooth and shall not be interrupted by projecting fittings.
  - F. Provide removable stainless steel chains with snap hooks where indicated.
  - G. Provide for expansion and contraction in the railing. Expansion joints must align with those in the structure to which the handrail is attached. Post spacing shall be located 1'-0" maximum to the right or left of expansion and contraction joints.
  - H. Railings and connections shall be capable of withstanding a concentrated load of at least 200 pounds or a uniform load of 50 pounds per foot applied in any direction at any point on the rail, whichever is the worst case.
  - I. Handrail post shall be base flange mounted unless otherwise noted on the Drawings. Stringer connections shall be as detailed on Drawings.
  - J. Design mounting flange and anchoring system to meet the loading requirements with a minimum safety factor of 4.
  - K. Permanent setting in concrete shall have posts set in sleeves and set in non-shrink, expanding grout.
  - L. All metal railings shall be aluminum unless steel is specifically called for on the Drawings or where new railing is designed to connect to and/or match existing steel railing.
  - M. Finish:
    - 1. Steel: Painted in accordance with Section 09 90 00; color to be selected by Architect.

## **2.5 SAFETY STAIR NOSINGS**

- A. Heavy-duty Cast Nosings:
  - 1. Material: #20 aluminum oxide, 65% minimum integrally cast with aluminum or cast iron.
  - 2. Minimum Thickness: 5/16".
  - 3. Tread Surface: 3" with diamond crosshatching, 1/16" deep.
  - 4. Minimum Tread Width: 3" less than the width of step.
  - 5. Anchoring: Integral anchors for fresh concrete, and countersunk corrosion resistant fasteners elsewhere.
  - 6. Design:
    - a. Concrete Stairs: Type 101.
    - b. Steel Pan Stairs: Type 101SP.
- B. Manufacturers: Specifications are based on product by the first named manufacturer. Equal products by other listed manufacturers are approved.
  - 1. Wooster Products, Inc.
  - 2. American Abrasive Metals Company
  - 3. Balco Inc.

## **2.6 VERTICAL LADDERS**

- A. Ladders shall conform to OSHA/ANSI A14.3 standards for fixed wall ladders. Manufacturers shall provide a certification of compliance.
- B. Ladders, unless otherwise shown on Drawings, shall be 16" clear between stringers with maximum rung spacing of 12".
- C. Mounting brackets shall be bent plates not less than 2-1/2" x 3/8" of dimensions to allow a 7" clearance from wall; brackets shall be spaced not more than 6' centers.
- D. Steel Ladder:
  - 1. Stringers, A36 steel, 2" x 3/8", minimum.
  - 2. Rungs, minimum 5/8" diameter, set into countersunk holes in stringers, welded and ground flush.
  - 3. Finish: Shop primed for field painting.
- E. Design Load: Design ladder rungs to support a concentrated center load of 1000 pounds.
- F. Provide safety rail and provisions as detailed on Drawings.
- G. Provide safety cage for ladders with vertical ascents over 20'.
- H. Refer to details on the Drawings for the removable ladder dimensional requirements.
- I. Ships ladders shall be a minimum of 30" wide with 3'-6" high top grab rails and aluminum top grating platform.

## **2.7 LADDER SAFETY POST**

- A. Basis-of-Design Manufacturer: Type LU Ladder Safety Post by The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 1-800-366-6530, Fax: 1-203-535-1582, Web: [www.bilco.com](http://www.bilco.com).
- B. Performance characteristics:
  - 1. Tubular post shall lock automatically when fully extended.
  - 2. Safety post shall have controlled upward and downward movement.
  - 3. Release lever shall disengage the post to allow it to be returned to its lowered position.
  - 4. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14" (356mm) on center and clamp brackets to accommodate ladder rungs up to 1-3/4" (44mm) in diameter.
- C. Post: Shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.
- D. Material of construction: Shall be aluminum Model LU-4.
- E. Balancing spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post.
- F. Hardware: All mounting hardware shall be Type 316 stainless steel.
- G. Finishes: Factory finish shall be mill finish aluminum.

## **2.8 PIPE BOLLARDS**

- A. Provide Schedule 40 black steel pipe of size and height indicated as detailed on the Drawings.
- B. Permanent Setting: Set posts in concrete to a depth of 3'-0"; footing diameter minimum 3 times post diameter. Fill posts completely with concrete (and dome on top.) (and top with malleable screw cap.)
- C. Removable Setting: Close bottom of steel pipe with 8 gauge welded plate. Fill pipe with concrete. After curing, cap top of pipe with 8 gauge welded plate. Furnish sleeves for installation into concrete.
- D. Bollard Sleeve: 1/4" thick polyethylene thermoplastic sleeve.
  - 1. Manufacturer: Ideal Shield, or equal.
  - 2. Color: Safety yellow sleeve and cap.
- E. Finish: Painted as specified in Section (09 90 00) (09900).

**2.9 STEEL PIPE SHOWER CURTAIN ROD & HANGER**

- A. Furnish and install 1" nominal outside diameter steel pipe curtain rod where indicated on drawings in Sally Port A107 in area adjacent to Water Service A107A.
- B. Steel:
  - 1. Curtain Rod: Nominal 1" diameter, Schedule 40, galvanized steel pipe.
- C. Wall Flange:
  - 1. Galvanized iron "medium flange" by Global Industrial, Model No. 798728 or equal for mounting each end of curtain rod to cmu wall.
- D. Hanger Support: Provide galvanized all thread rod at mid-point of radiused curtain rod (length as required), from structure above down to a galvanized clevis or split-ring type pipe hanger.

**PART 3 EXECUTION****3.1 PREPARATION**

- A. Clean dirt, debris, oil, grease and other foreign substances from surfaces to receive metal items.
- B. Dissimilar Materials: Isolate dissimilar materials to prevent electrolytic actions by neoprene gaskets, asphaltum paint or other materials.

**3.2 WORKMANSHIP**

- A. General: Refer to the Drawings for items required; items require the following workmanship classes and finishes.
  - 1. Concealed Items: Class 3.
  - 2. Exposed Items in Utility Areas: Class 2.
  - 3. Exposed Items in Finished Areas: Class 1.
  - 4. Steel Items Subject to Contact with Moisture: Galvanized finish.
  - 5. Steel Items not Subject to Contact with Moisture: Primed finish.
- B. Details and connections shall be carefully made and fitted, with special care exercised to produce a thoroughly neat appearance; make pieces in accordance with detail shop drawings; members shall be true to length so assembling may be done without fillers, except where required by details; allow no projecting edges or corners where different members are assembled; do mitering and blocking precisely.
- C. Set built-up parts true to line and without sharp bends, twists or kinks.
- D. Provide caulking as required to set, seal and secure metal items; refer to Section 07 90 00 - Caulking and Sealant Work.

**3.3 BURNING AND WELDING**

- A. Burning: Burning of holes in field shall not be permitted without consent; if consent is given, burned members shall be finished to an appearance equal to sheared finish; burning shapes to length with standard flame-cutting machine will be permitted.
- B. Perform both shop and field welding in accordance with recommendations of American Welding Society. Welds shall be solid and homogeneously a part of metals joined, free from pits or incorporated slag or scale; surfaces of welds shall be smooth and regular, of full area indicated or necessary to develop required strength of joint.

**3.4 INSTALLATION**

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- A. Erect work to lines and levels, plumb and true, in correct relation to adjoining work; secure parts in rigid, durable manner. Provide concealed connections wherever possible.
- B. Provide anchors and inserts in sufficient number for proper fastening of metal items; embed anchors in concrete so as to accurately align metalwork at proper level.
- C. Where necessary to secure miscellaneous metalwork to structure by means of expansion bolts, cinch anchors and similar connections, do work of laying out, installing such connections, installing miscellaneous work, and bolting up.
- D. Throughout work, provide anchors, inserts wherever possible for building adjoining work; where lugs are shown or specified for building into adjoining masonry, erect parts having lugs before masonry is built; elsewhere, bring work to building in as large pieces as practicable, attach to anchors or inserts during erection.
- E. Connections made to sleeve inserts, except where noted removable, install members into sleeves, wedged tight with metal wedges; pour surrounding space full of expanding grout; caulk to finish flush with adjoining surface.

### **3.5 CONNECTIONS**

- A. Unless otherwise specified, all shop connections shall be welded or riveted; framing connections made in field shall be made with high tension steel bolts; other connections may be made by any of the above methods, or with standard strength bolts.
- B. All connections shall develop strength required for members involved; in no case less than AISC standard.
- C. Provide lugs, clips, connections, rivets, bolts, necessary for complete fabrication, erection; bolts remaining in finished, exposed work shall be hexagon head bolts with hexagon nuts; bolts shall be of proper length to permit full thread in nut, but not project more than 1/4" beyond face of nut. Rivets, both shop and field, power driven; shall provide 100 lbs. per sq. in. at hammer minimum.
- D. High Tension Steel Bolts: Furnish and install in accordance with " Specification for Structural Joints using ASTM A325 or A490 Bolts " of AISC, as amended to date.

### **3.6 FIELD PAINTING**

- A. Where shop coat is abraded or burned by welding, clean and touch-up.
- B. Repair surfaces of zinc coating that have been damaged during delivery, storage or installation by thoroughly wire brushing the damaged areas and removing all loose and cracked zinc coating, then paint the cleaned areas with 2 coats of zinc-dust, zinc-oxide primer; touch-up zinc-dust coated surfaces with the same material as the coating.
- C. Field paint in accordance with the requirements of Section 09 90 00.

### **3.7 CLEAN UP**

- A. All work shall be left in clean condition, and all debris and rubbish cleaned up and removed from site by Contractor.

**END OF SECTION 05 50 00**