

SECTION 05100

METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes specifications for metal fabrications, including minimum requirements for fabricator, and galvanizing.

1.02 REFERENCE STANDARDS

- A. ASTM International (ASTM):
 - 1. A27 Specification for Steel Castings, Carbon, for General Application
 - 2. A36 Specification for Carbon Structural Steel
 - 3. A48 Specification for Gray Iron Castings
 - 4. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 5. A109 Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled
 - 6. A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 7. A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 8. A307 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
 - 9. A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - 10. A488 Standard Practice for Steel Castings, Welding, Qualifications of Procedures and Personnel
 - 11. A536 Specifications for Ductile Iron Castings
 - 12. A563 Specification for Carbon and Alloy Steel Nuts
 - 13. A653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 14. A780 Practice for Repair of Damaged Hot-Dip Galvanized Coatings

15. D6386 Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
 16. F436 Specification for Hardened Steel Washers
- B. American Welding Society (AWS):
1. D1.1 Structural Welding Code Steel
- C. Department of Defense (DOD):
1. DOD-P-15328 Primer (Wash), Pretreatment (Formula No. 117 For Metals) (Metric)
- D. Federal Specifications (FS):
1. QQ-F-461 Floor Plate, Steel, Rolled
- E. Steel Structures Painting Council (SSPC):
1. SSPC-SP 1 Solvent Cleaning
 2. SSPC-SP 3 Power Tool Cleaning
 3. SSPC-PA 1 Shop, Field & Maintenance Painting
 4. SSPC-Paint 20 Zinc-Rich Primers (Type I – Inorganic & Type II – Organic)
 5. SSPC-Paint 22 Epoxy-Polyamide Paints (Primers, Intermediate & Topcoats)

1.03 SUBMITTALS

- A. Submit shop drawings showing the following:
1. Sizes, details of fabrication and construction, methods of assembly, locations of hardware, anchors, and accessories, and installation details.
 2. Details for manufacturer's items or fabricated metalwork.
 3. Field erection details showing cuts, copes, connections, holes, threaded fasteners and welds, both shop and field, by symbols conforming to AWS standards. Indicate net weld lengths.
- B. Submit manufacturers' product data. Include application instructions for galvanizing repair product.
- C. Metal Fabricator: Submit a list of projects demonstrating a minimum of 5 years of experience in the custom fabrication and construction of metal fabrications and miscellaneous metalwork.

- D. Written verification from the manufacturer that the primer is compatible with the finish coats specified in Section 09900, Paints and Coatings.

1.04 DELIVERABLES

- A. Welders' Certificates: Submit certification of personnel employed on the work to satisfy the requirements of Part 4 of AWS D1.1.

1.05 QUALITY ASSURANCE

- A. All metal fabrications shall be done by a licensed fabrication shop with a minimum of 5 years of experience in this type of work.
- B. Welding including shielded arc process shall conform to the requirements in AWS D1.1 Structural Welding Code

PART 2 - PRODUCTS

2.01 STEEL

- A. Plates, Shapes and Bars: ASTM A36, unless otherwise noted
- B. Sheet, Commercial Quality, Galvanized: ASTM A653, G90
- C. Strip: ASTM A109
- D. Pipe: ASTM A53, Grade B, Schedule 40, black or galvanized, as indicated
- E. Castings: ASTM A27 or A48, as indicated
- F. Ductile Iron: ASTM A536

2.02 FASTENERS

- A. Steel Bolts, Anchor Bolts, Nuts, Shear Studs and Threaded Rods: ASTM A 307, ASTM A 563, and ASTM F 436, unless otherwise noted. Bolts and studs, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A 153.
- B. High Strength Steel Bolts and Nuts: ASTM A 325, unless otherwise noted.
- C. Threaded Inserts: ASTM A 488, unless otherwise noted.

2.03 MISCELLANEOUS MATERIALS

- A. Use E7018 low hydrogen electrodes for A36 steel.
- B. Primer Pretreatment: DOD-P-15328.
- C. Corrosion-Inhibitive Metal Primer: SSPC-Paint 20 or SSPC-Paint 22. Verify compatibility of shop primer and finish coats specified in Section 09900, Paints and Coatings.

2.04 CHECKERED SAFETY PLATE

- A. FS QQ-F-461, Class 1, flat black, standard 4-way raised pattern.

2.05 IRON CASTINGS

- A. Gray: ASTM A48, Class 35B, unless otherwise noted.

2.06 FABRICATION - GENERAL

- A. Fabricate miscellaneous metal items with light structural angles, tees, bars, channels, plates, rods, pipes and other rolled steel shapes, as indicated in the Contract Documents and specified herein.
- B. Fabricate work true to shape, size and tolerances as indicated on the Contract Drawings and approved shop drawings; with straight lines, square corners or smooth bends; free from twists, kinks, warps, dents, and other imperfections. Straighten work bent by shearing or punching. There shall be no exposed screws, bolts, and fasteners in the finished work, except as indicated or required.
- C. Utilize metal of sufficient thickness and detail assembly and support to provide strength and stiffness sufficient to resist distortion during shipment, handling, installation, and severe service conditions. Exposed edges and ends of metal shall be ground smooth with no sharp edges and with corners slightly rounded. Connections and joints exposed to weather shall be watertight.
- D. Form curved work to radii indicated. Furnish bolts, nuts, washers, and other fastening devices required for securing work.
- E. For pipe sleeves in concrete construction, provide standard weight, black steel pipe with anchors welded to exterior. Provide sizes as required to accommodate passage of conduits, pipes, ducts and similar items with proper clearance.
- F. Fabricate flanges for posts from 3/8-inch minimum thickness plate, and for standoffs from not less than 3/16-inch thickness plate.
- G. Metal fabrications shall be prefabricated and preassembled in the factory or shop as far as practicable.
- H. Grind off excess metal and make smooth surface welds which will be exposed to view.

2.07 GALVANIZING

- A. Steel and ferrous metal items in contact with concrete, on the exterior of buildings, exposed to the weather and moist conditions, and items specifically indicated, shall be galvanized after fabrication. Fabricate items complete or in largest practical sections before galvanizing. Do not field weld fabricated items except where indicated or permitted by the Engineer. Thoroughly clean welded

areas prior to galvanizing. Remove weld spatter, burrs, oil, grease and any other deleterious matter that would interfere with the adherence of the zinc.

- B. Hot dip galvanize products after fabrication (including shearing, punching, bending, forming, or welding) in accordance with ASTM A 123.
- C. The weight of zinc coating shall conform to the requirements specified under "Weight of Coating" in ASTM A 123, but not be less than 2.0 ounces per square foot of surface area.
- D. Shop galvanized metalwork necessitating field welding which in any manner removes original galvanizing shall be restored by field galvanizing repair in accordance with ASTM A 780.
- E. Hardware items, and bolts and screws for attachment of galvanized items shall be galvanized in accordance with ASTM A 153.

2.08 SHOP FINISHING

- A. Nongalvanized Metalwork: Shop paint ferrous metal which is not indicated to be galvanized.
 - 1. After fabrication and immediately before shop painting, power-tool clean ferrous metalwork in accordance with SSPC-SP 3 to remove mill scale, rust, grease, oil, and any other foreign matter. Wire brush welds thoroughly.
 - 2. After power-tool cleaning and just before shop painting, wash ferrous metalwork with solvent to remove dust and residue in accordance with SSPC-SP 1.
 - 3. After cleaning and solvent washing, shop paint ferrous metalwork with one coat of corrosion-inhibitive metal primer in accordance with SSPC-PA 1. Material and application shall conform to SSPC-Paint 20 or SSPC-Paint 22.
- B. Galvanized Metalwork:
 - 1. Galvanized metal surfaces indicated to be painted shall be prepared for painting in accordance with ASTM D 6386.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install metal fabrications with installation accessories furnished by fabricator as required for complete installation.
- B. Install in accordance with approved shop drawings, true and horizontal, perpendicular, or at required angle, as the case may be, level and square with angles and edges parallel with related lines of structure.

- C. Install threaded rods used as dowels as specified in Section 03200, Concrete Reinforcing.
- D. Field welding, where indicated or allowed, shall conform to the requirements for welding as specified in Section 05200, Structural Steel.
- E. Keep field joints to a minimum and concealed. Make field joints strong, rigid, watertight and flush with hairline fit. Grind sharp corners smooth.
- F. Grind off excess metal and make smooth surface welds which will be exposed to view.
- G. Securely grout posts set in sleeves in conformance to grout manufacturer's instructions. Attach posts not set in sleeves with appropriate fasteners.
- H. After installation, damaged prime surfaces shall be prepared as required and touched up with the same primer used for shop primer; leave ready for field painting.

3.02 GALVANIZING REPAIR

- A. Galvanized surfaces which have become damaged from welding, handling, or installation shall be repaired immediately after installation with galvanizing repair material in accordance with ASTM A 780.

END OF SECTION