# SECTION 05 50 00 - METAL FABRICATIONS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Shop fabricated steel items.

### 1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 03 4100 - Precast Structural Concrete: Placement of metal fabrication in precast structural concrete.

C. Section 03 4500 - Precast Architectural Concrete: Placement of metal fabrication in precast architectural concrete.

D. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

E. Section 04 2600 - Single-Wythe Unit Masonry: Placement of metal fabrications in masonry.

F. Section 04 2731 - Reinforced Unit Masonry Assemblies: Placement of metal fabrications in masonry.

G. Section 05 100-Structural Steel: Structural steel column anchor bolts, joist bearing plates, including anchorage, and bearing plates for metal deck bearing, including anchorage.

H. Section 05 5100 - Metal Stairs.

I. Section 05 5133 - Metal Ladders.

J. Section 05 5213 - Pipe and Tube Railings.

K. Section 07 7123 - Manufactured Gutters and Downspouts: Downspout boots.

L. Section 09 9000 - Paints and Coatings: Paint finish.

M. Section 09 9123 - Interior Painting: Paint finish.

N. Section 32 3300 - Site Furnishings: Steel pipe bollards to match other site furnishings.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for additional requirements.

B. Components:

1. Basis of Measurement: By the pound.
2. Basis of Payment: Includes fabrication, finishing, and installation.

C. Components:

1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes fabrication, finishing, and installation.

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

E. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

G. ASTM A48/A48M - Standard Specification for Gray Iron Castings.

H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

J. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

K. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

L. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

M. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

N. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

O. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009.

P. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

Q. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

R. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

S. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

T. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

U. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

V. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

W. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

X. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

Y. AWS D1.1/D1.1M - Structural Welding Code - Steel.

Z. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

AA. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

BB. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

CC. SSPC-SP 2 - Hand Tool Cleaning.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer in the state of the project.
   a. Include the following, as applicable:
      1) Design criteria.
      2) Engineering analysis depicting stresses and deflections.
      3) Member sizes and gages.
      4) Details of connections.
      5) Support reactions.
      6) Bracing requirements.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

E. Designer's Qualification Statement.

1.6 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

**PART 2 - PRODUCTS**

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500 Grade B cold-formed structural tubing.

C. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.

D. Slotted Channel Framing: ASTM A 653 Grade 33.

E. Slotted Channel Fittings: ASTM A1011/A1011M.

F. Fasteners:
1. General: Furnish and install zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
2. Use regular hexagon head type anchor bolts and nuts, ASTM A 307, Grade A.
3. Use square head type lag bolts, FS FF-B-561.
4. Use cadmium plated steel machine screws, FS FF-S-92.
5. Use flat head carbon steel wood screws, FS FF-S-111.
6. Use round plain carbon steel washers, FS FF-W-92.
7. Use anchors conforming to the following requirements:
   a. Use threaded type concrete inserts with galvanized ferrous castings, internally threaded to receive ¾ inch diameter machine bolts; either malleable iron complying with ASTM A 47, or cast steel complying with ASTM A 27 hot-dip galvanized complying with ASTM A 153.
8. Use helical spring type carbon steel lock washers, FS FF-W-84.

G. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

H. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M) Type 1 galvanized to ASTM A 153/A 153M where connecting galvanized components.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.3 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.

1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
3. Space rungs 7 inches from wall surface.

B. Bumper Posts and Guard Rails: As detailed; prime paint finish.

C. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

E. Lintels: As detailed; prime paint finish.

F. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.

## 2.4 FINISHES - STEEL

A. Prime paint all steel items.

1. Exceptions: Galvanize items to be embedded in concrete or masonry and items specified for galvanized finish.
2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.5 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated .

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasionsand surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 50 00