

**SECTION 05 50 00  
METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
  - 1. Railings.

**1.2 RELATED WORK**

- A. Prime and finish painting: Section 09 91 00, PAINTING.

**1.3 DESIGN REQUIREMENTS:**

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.
- B. Structural Performance: Engineer, fabricate, and erect railing systems to withstand design loads within limits and under conditions required.
  - 1. Design Loads: As required by code.
  - 2. Design railing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).
  - 3. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare stamped design calculations, shop drawings, and other structural data.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
  - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
  - 3. Provide templates and rough-in measurements as required.

4. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- C. Design Calculations: Provide documentation of delegated design, stamped and signed by a qualified engineer.

## **1.5 QUALITY ASSURANCE**

- A. Structural Designer Qualifications: Professional Engineer experienced in design of this work and licensed in Iowa, or personnel under direct supervision of such an engineer.
- B. Fabricator: Company specializing metal fabricating items similar in material, design, and extent to those indicated for this Project.
- C. Welders: Certified per AWS requirements within the previous 12 months.
- D. Assembled product to the greatest extent possible before delivery to the site.

## **1.6 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
  - B18.6.1-81(R1997) ..... Wood Screws
  - B18.2.2-87(R2005) ..... Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
  - A36/A36M-05 ..... Structural Steel
  - A29/A29M-05 ..... Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for.
  - A47-99(R2004) ..... Malleable Iron Castings
  - A48-03 ..... Gray Iron Castings
  - A53-06 ..... Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
  - A123-02 ..... Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - A167-99(R2004) ..... Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
  - A269-07 ..... Seamless and Welded Austenitic Stainless Steel Tubing for General Service
  - A307-07 ..... Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
  - A312/A312M-06 ..... Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

A391/A391M-01.....	Grade 80 Alloy Steel Chain
A500/A500M-07.....	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A513-07 .....	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
A653/A653M-07.....	Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
A786/A786M-05.....	Rolled Steel Floor Plate
A879/A879M-06.....	Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
A992/A992M-02.....	Standard Specification for Structural Steel Shapes
B221-06 .....	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
B456-03 .....	Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
B632-02 .....	Aluminum-Alloy Rolled Tread Plate
C1107-07 .....	Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
D3656-04 .....	Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
F436-07 .....	Hardened Steel Washers
F468-06.....	Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
F593-02.....	Stainless Steel Bolts, Hex Cap Screws, and Studs
F1667-05 .....	Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):

D1.1-04 .....	Structural Welding Code Steel
D1.2-03 .....	Structural Welding Code Aluminum
D1.3-98 .....	Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)

AMP521-01 .....	Pipe Railing Manual
AMP 500-505-1988 .....	Metal Finishes Manual

F. Structural Steel Painting Council (SSPC):

SP 1-05.....	No. 1, Solvent Cleaning
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SP 2-05.....No. 2, Hand Tool Cleaning

SP 3-05.....No. 3, Power Tool Cleaning

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.
- B. Railings and Handrails: 900 N (200 pounds) in any direction at any point.

### **2.2 MATERIALS**

- A. Structural Steel: ASTM A36 or A992.
- B. Steel Tubing: ASTM A513 or ASTM A500.
- C. Steel Bars: ASTM A29/A9M.
- D. Galvanization: All steel used in handrails and guardrails to be galvanized, conforming to ASTM A123, A653 or the equivalent A879.
- E. Primer Paint: As specified in Section 09 91 00, PAINTING.
- F. Grout: ASTM C1107, pourable type.

### **2.3 HARDWARE**

- A. Fasteners:
  - 1. Bolts with Nuts:
    - a. ASME B18.2.2.
    - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
    - c. ASTM F468 for nonferrous bolts.
    - d. ASTM F593 for stainless steel.
  - 2. Screws: ASME B18.6.1.
  - 3. Washers: ASTM F436, type to suit material and anchorage.

### **2.4 FABRICATION GENERAL**

- A. Material
  - 1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
  - 2. Use material free of defects which could affect the appearance or service ability of the finished product.
- B. Size:
  - 1. Size and thickness of members as shown.

2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Weld all joints unless noted otherwise or approved in writing by Architect.
2. All approved mechanical connections to be located where not easily viewed and to be flush.
3. Where fasteners and anchors are permitted, design the type, size, location and spacing to develop a joint strength of not less than the design value without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
4. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
5. Use screws and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.

D. Workmanship

1. General:
  - a. Fabricate items to design shown.
  - b. Furnish members in longest lengths commercially available within the limits shown and specified.
  - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
  - d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
  - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
  - f. Prepare members for the installation and fitting of hardware.
  - g. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
  - a. Weld in accordance with AWS.
  - b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.

- c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
  - d. Finish welded joints to match finish of adjacent surface.
- 3. Joining:
  - a. Miter or butt members at corners.
  - b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
- 4. Cutting and Fitting:
  - a. Accurately cut, machine and fit joints, corners, copes, and miters.
  - b. Design and construct field connections in the most practical place for appearance and ease of installation.
  - c. Fit pieces together as required.
  - d. Fabricate connections for ease of assembly and disassembly without use of special tools.
  - e. Joints firm when assembled.
  - f. Conceal joining, fitting and welding on exposed work as far as practical.
  - g. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.
- E. Finish:
  - 1. After cleaning and finishing apply primer and finish coats as specified in Section 09 91 00, PAINTING.

## **2.5 RAILINGS**

- A. In addition to the dead load design railing assembly to support live load specified.
- B. Fabrication General:
  - 1. Provide continuous welded joints, dressed smooth and flush.
  - 2. Standard flush fittings, designed to be welded, may be used.
  - 3. Exterior Post Anchors: Embed in grout as shown on Drawings.
- C. Steel Pipe Railings:
  - 1. Fabricate of steel tube as described on Drawing with welded joints.
  - 2. Number and space of posts as shown on Drawings and as required to meet load resistance requirements, but not over 1800 mm (6 feet) on centers between posts.
- D. Provide for expansion and contractions as necessary

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Items gouted into concrete or masonry.
  - 1. Provide temporary bracing for such items until grout is set.
  - 2. Place in accordance with setting drawings and instructions.
- C. Field weld in accordance with AWS.
  - 1. Design and finish as specified for shop welding.
  - 2. Use continuous weld unless specified otherwise.
- D. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified.
- E. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

### **3.2 RAILINGS**

- A. General:
  - 1. All field connections to be welded unless noted otherwise or approved by Architect.
  - 2. All approved mechanical connections to be located where not easily viewed and to be flush.
- B. Steel Posts:
  - 1. Embed posts as shown on Drawings. Allow for installation of sealant as shown and as specified in Section 07 92 00, JOINT SEALANTS.
  - 2. Secure sliding flanged fittings to posts at base with set screws. Screw to be set flush and painted to match post.
  - 3. Field joints in posts to be welded or filled and ground flush and primed and painted.
- C. Finish:
  - 1. Restore zinc coating, primer, and intermediate coat where damaged or removed for field welding or other assembly activity before applying finish coat.
  - 2. Field apply finish coat. See Section 09 91 00, PAINTING.

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