

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.

**1.2 RELATED WORK**

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

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
1. Wall bracing and supports.
  2. Panel bracing and supports.
  3. Generator/Paralleling Switchgear weatherproof enclosures.
  4. Duplex Fuel Oil Pump Steel Decking.
- C. 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.
- D. Manufacturer's Certificates:
1. Anodized finish as specified.
  2. Live load designs as specified.
- E. Design Calculations for specified live loads including dead loads.

**1.4 QUALITY ASSURANCE**

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.
- C. Assembled product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

#### 1.5 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
  - 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
  - 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
  - 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

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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  
MBG 531-00.....Metal Bar Grating Manual  
MBG 532-00.....Heavy Duty Metal Bar Grating Manual

F. Structural Steel Painting Council (SSPC):

SP 1-05.....No. 1, Solvent Cleaning  
SP 2-05.....No. 2, Hand Tool Cleaning  
SP 3-05.....No. 3, Power Tool Cleaning

G. Federal Specifications (Fed. Spec):

RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Structural Steel: ASTM A36.
- B. Primer Paint: As specified in Section 09 91 00, PAINTING.

**2.2 HARDWARE**

A. Rough Hardware:

- 1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
- 2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. 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.
- 2. Screws: ASME B18.6.1.
- 3. Washers: ASTM F436, type to suit material and anchorage.

**2.3 FABRICATION GENERAL**

A. Material

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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. Except as otherwise specified, connections may be made by welding, or bolting.
2. Riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for bolts: Accurately punched or drilled and burrs removed.
5. 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.
6. Use bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.

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5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

**E. 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.
- h. 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. Anchors:**

- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
- b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.

**5. Cutting and Fitting:**

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- 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. Do not show screws prominently on the exposed face.
  - h. 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.
- F. Finish:
- 1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
  - 3. Steel: NAAMM AMP 504.
    - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
    - b. Surfaces exposed in the finished work:
      - 1) Finish smooth rough surfaces and remove projections.
      - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
    - c. Shop Prime Painting:
      - 1) Surfaces of Ferrous metal:
        - a) Items not specified to have other coatings.
        - b) Galvanized surfaces specified to have prime paint.
        - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
        - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
        - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
      - 2) Non ferrous metals: Comply with MAAMM-500 series.
- G. Protection:
- 1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white

bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.

2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

## **2.4 SUPPORTS**

### **A. General:**

1. Fabricate ASTM A36 structural steel shapes as shown.
2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
3. Field connections may be welded or bolted.

### **B. For Trapeze Bars:**

1. Construct assembly above ceilings as shown and design to support not less than a 340 kg (750 pound) working load at any point.
2. Fabricate trapeze supports as shown, with all exposed members, including screws, nuts, bolts and washers, fabricated of stainless steel.
3. Fabricate concealed components of structural steel shapes unless shown otherwise.
4. Stainless steel ceiling plate drilled for eye bolt.
5. Continuously weld connections where welds shown.
6. Use modular channel where shown with manufacturers bolts and fittings.
  - a. Weld ends of steel angle braces to steel plates and secure to modular channel units as shown. Drill plates for anchor bolts.
  - b. Fabricate eye bolt, special clamp bolt, and plate closure full length of modular channel at ceiling line and secure to modular channel unit with manufacturers standard fittings.

## **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 set into concrete or masonry.
  1. Provide temporary bracing for such items until concrete or masonry is set.
  2. Place in accordance with setting drawings and instructions.
  3. Build strap anchors, into masonry as work progresses.
- C. Field weld in accordance with AWS.

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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. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- 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.
- F. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.
- G. Secure escutcheon plate with set screw.

**3.2 INSTALLATION OF SUPPORTS**

- A. Anchorage to structure.
  1. Secure supports to concrete inserts by bolting or continuous welding as shown.

**3.3 SHELF ANGLES**

- A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.
- B. Provide expansion space at end of members.

**3.4 CLEAN AND ADJUSTING**

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

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