

PART I – GENERAL**WORK SPECIFIED HEREIN**

All labor, materials, equipment and services necessary to provide the miscellaneous metals and related items as indicated or specified.

SUBSTITUTIONS

In accordance with Section 01600.

DESCRIPTION OF WORK

The extent of miscellaneous metal work is shown on the drawings and includes items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipe and castings which are not a part of the structural steel or other metal systems in other sections of these specifications.

The types of miscellaneous metal items include, but are not limited to the following:

- Carpenter's iron work
- Steel gratings and frames
- Steel pipe bollards and guard posts
- Ladders
- Interior steel stairs
- Loose bearing plates
- Miscellaneous framing and supports
- Miscellaneous steel trim
- Steel angle corner guards
- Steel channel door frames
- Steel dock angles
- Steel angle jambs
- Steel O.H. door supports

STRUCTURAL PERFORMANCE

Design, engineer, fabricate and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

- Comply with the requirements of the authorities having jurisdiction at site location if those requirements are more stringent than those indicated herein.
- Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress.
- Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
- Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

QUALITY ASSURANCE

Comply with the provisions of the following codes, standards and specifications, except as otherwise shown and specified.

- AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," including "Commentary of the AISC Specifications".
- AISI "Specifications for the Design of Cold-Formed Steel Structural Members".
- AWS "Structural Welding Code - Steel".
- ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piping and Bars for Structural Use".

Professional of Record Qualifications

A Professional who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design and extent.

Qualification for welding work

Qualify welding processes and welding operators in accordance with AWS "Standard Qualifications Procedure".

Field Measurement

Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.

Inserts and Anchorages

Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

Shop Assembly

Pre-assemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassembly units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinate installation.

PART II – PRODUCTS**MATERIALS**

Metal Surfaces - General: For the fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding or by welding and grinding, prior to cleaning, treating and application of surface finishes including zinc coatings.

- Steel Plates, Shapes and Bars: *ASTM A36*
- Steel Bars and Bar-size Shapes: *ASTM A36*
- Steel Tubing: (Hot formed, welded or seamless): *ASTM A501*
- Hot-rolled Carbon Steel Bars: *ASTM A108, Grade as selected by fabricator.*

- Hot-rolled Carbon Steel Sheets and Strips: *ASTM A568 and ASTM A569; pickled and oiled.*
- Cold-rolled Carbon Steel Sheets: *ASTM A336.*
- Galvanized Carbon Steel Sheets: *ASTM A526, with ASTM A525, G90 zinc coating.*
- Cold-drawn Steel Tubing: *ASTM A512, sunk drawn, butt welded, cold-finished and stress-relieved.*
- Steel Pipe: *ASTM A53, type as selected; Grade A. Black finish unless galvanizing is required. Standard weight, Schedule 40, unless otherwise shown or specified.*

ANCHORS

Thread-type Concrete Inserts

Galvanized ferrous castings internally threaded to receive 3/4" diameter machine bolts; either malleable iron complying with ASTM A47 or cast steel complying with ASTM A27; hot-dip galvanized in compliance with ASTM A153.

Wedge-type Concrete Inserts:

Galvanized box-type ferrous castings, designed to accept 3/4" diameter bolts having special wedge-shaped heads, either malleable iron complying with ASTM A47 or cast steel complying with ASTM A27; hot-dipped galvanized in compliance with ASTM A153. Provide carbon steel bolts having special wedge-shaped heads, nuts, washers and shims; all galvanized in compliance with ASTM A153.

Slotted-type Concrete Inserts:

Galvanized 1/8" thick pressed steel plate complying with ASTM A283. Box-type welded construction with slot designed to receive 3/4" diameter square head bolt and with knockout cover. Hot-dip galvanized in compliance with ASTM A123.

Masonry Anchorage Devices

Expansion shield; FS FF-S-325.

Toggle Bolts

Tumble-wing type; FS FF-B-588, type, class and style as required.

FASTENERS

General: Provide zinc-coated fasteners with galvanized complying with ASTM A153 for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.

- Bolts and Nuts: *ASTM A307, Grade A, regular hexagon head.*
- Bolts, Hexagon and Square: *ANSI B-18.2.1.*
- Bolts, Round Head: *ANSI B-18.5.*
- Lag Bolts: *FS FF-B-561, square head type.*
- Wood Screws: *ANSI B-18.6.1, flat head carbon steel.*
- Plain Washers: *FS FF-W-84, helical spring type carbon steel.*

PAINT

- Metal Primer Paint: *FS TT-P-636.*
- Galvanizing Repair Paint: *High zinc dust content paint for regalvanizing welds in galvanized steel, complying with military specifications MIL-P-21035 (Ships).*

FABRICATION, GENERAL

Workmanship:

- Use materials of the size and thickness shown, or if not shown, of the required sized and thickness to produce adequate strength and durability of the finished product for the intended use. Work to the dimensions of fabrication and support. Use the type of materials shown or specified for the various components of work.
- Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.
- Weld corners and seam continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.
- Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flat-head (countersunk) screws or bolts.
- Cut, reinforce, drill and tap miscellaneous metal work as may be required to receive finish hardware and similar items of work. Use hot-rolled steel bars for work fabricated from bar stock, unless work is indicated to be fabricated from cold-rolled or cold-finished stock.

Galvanizing:

Provide zinc coating for those items shown or specified to be galvanized, using the hot-dip process after fabrications. ASTM A153 for galvanizing of iron and steel hardware. ASTM A123 for galvanizing of rolled, pressed and forged steel shapes, plates, bars, and strip 1/8" thick and heavier and for galvanizing of assembly projects.

Shop Painting:

- Shop paint miscellaneous metal work, except those members or positions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.

- Remove scale, rust and other deleterious materials before the shop coat of paint is applied. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning, or SSPC SP-7 "Brush-off Blast Cleaning". Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".
- Apply one shop coat of metal primer paint to fabricated metal items, except apply 2 coats of paint to surfaces which are inaccessible after assembly or erection.
- Immediately after surface preparation, brush or spray on metal primer paint, applied in accordance with the manufacturer's instructions, and at a rate to provide a uniform dry film thickness of 2 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.

PART III – EXECUTION

MISCELLANEOUS METAL ITEMS:

Carpentry's Iron Work:

Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware are specified in Division 6 Sections.

Ladders:

Fabricate ladders for the locations shown, with dimensions, spacing, details and anchorages as required. Comply with the requirements of ANSI A14.3, except as otherwise shown. Provide 3" x 3" x 1/4" steel angle bracket at max. 6'-0" o.c., 3/8" x 3" continuous structural steel plate stringer with eased edges, spaced 18" apart. Provide 3/4" diameter, No. 6 deformed steel rebar rungs (for slip resistance), spaced 12" o.c.

Fit rungs into punched holes in centerline of side rails, plug weld and grind smooth on outer rail faces.

Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder 6" clear of the wall surface and other obstructing construction. Extend rails 42" above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structures does not extend above the top rung, gooseneck the extended rails back to the structure to provide secure ladder access.

Provide non-slip surfaces on the top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or deformed steel reinforced bars.

Loose Bearing Plates:

Provide loose bearing plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness

and bearing area. Drill plates to receive anchor bolts and for grouting as required.

Loose Steel Lintels:

Provide loose structural steel shape lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit. Provide not less than 4" bearing at each side of openings, unless otherwise shown.

Miscellaneous Framing and Supports:

Provide miscellaneous steel framing and supports which are not a part of the structural steel framework as required to complete the work.

Miscellaneous Steel Trim:

Provide shapes and sizes as required for the profiles shown. Except as otherwise noted, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

Shelf Angles:

- Provide structural steel shelf angles of sizes shown for attachment to concrete framing. Provide slotted holes to receive 3/4" bolts, spaced not more than 6" from ends and not more than 24" o.c., unless otherwise shown.
- Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.
- Security bars (provide if smoke/heat vents are required):
- Provide security bars where indicated and at all openings through the roof 12" or greater in any direction. Fabricate of 5/8" diameter steel bar 6" on center each way. All joints and intersections shall be welded. Provide steel angle frame to suit opening and bolt securely to opening with 3/4" diameter bolts at 24" centers. Deform or weld threads to prevent removal of bolts.

Gratings:

Grating in utility trench shall be McNichols Co. (or equal) electro-pressure welded construction type with 1" x 1/4" bearing bars spaced at 1-3/16" centers and 1/2" x 3/16" cross bars spaced at 2" centers. Wearing surface of bearing bars and of cross bars shall be serrated. Grating shall be hot-dipped galvanized after fabrication. Furnish perimeter support angles with welded anchors as detailed.

STAIRS - INTERIOR:

Stair Framing:

Fabricate stringers of structural - steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers.

Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

Steel Floor Plate Treads, Risers, and Platforms:

Form to configurations shown from raised-pattern steel floor plate of thickness necessary to support indicated loads, but not less than 1/4 inch (6.4 mm).

END OF SECTION