

SECTION 05500 - METAL FABRICATIONS

A. General:

1. Definitions in ASTM E 985 for railing-related terms apply to this section.
2. Structural Performance of Handrails and Railing Systems: Comply with ASTM E 985 based on testing per ASTM E 894 and E 935.
3. Structural Performance of Handrails and Railing Systems: Provide handrails and railing systems capable of withstanding the following structural loads without exceeding the allowable design working stress of materials involved:
 - a. Top Rails of Guardrail Systems: Concentrated load of 300 lbf applied at any point and a uniform load of 100 lbf per linear ft. with each load applied nonconcurrently with respect to direction and each other, vertically downward or horizontally.
 - b. Handrails Not Serving as Top Rails: Concentrated load of 200 lbf applied at any point and a uniform load of 50 lbf per linear ft. with each load applied nonconcurrently with respect to direction and each other, vertically downward or horizontally.
 - c. Infill Area of Guardrail Systems: Horizontal concentrated load of 200 lbf applied to one sq. ft. at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.
4. Submittals: In addition to product data, submit the following:
 - a. Shop drawings showing details of fabrication, assembly and installation including templates for anchor bolt placement.
 - b. Samples of materials and finished products as may be requested by Architect.

A. Products:

1. General: For work exposed to view use materials selected for their smoothness and freedom from surface blemishes.
2. Steel Plates, Shapes, and Bars: ASTM A 36.
3. Steel Bars for Grating: ASTM A 569 or A 36.
4. Wire Rod for Grating Cross Bars: ASTM A 510.
5. Cold-Formed Steel Tubing: ASTM A 500, grade as indicated below:
 - a. Grade B, unless otherwise indicated or required for design loading.
6. Hot-Formed Steel Tubing: ASTM A 501.
 - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
7. Uncoated Cold-Rolled Structural Steel Sheet: ASTM A 611, Grade A, unless otherwise indicated or required by design loading.

8. Uncoated Hot-Rolled Structural Steel Sheet: ASTM A 570, Grade 30, unless otherwise indicated or required by design loading.
9. Uncoated Cold-Rolled Commercial Quality Steel Sheet: ASTM A 366.
10. Uncoated Hot-Rolled Commercial Quality Steel Sheet: ASTM A 569.
11. Galvanized Structural Quality Steel Sheet: ASTM A 446; Grade A, unless another grade required for design loading, and G90 coating designation unless otherwise indicated.
12. Galvanized Commercial Quality Steel Sheet: ASTM A 526, G90 coating designation unless otherwise indicated.
13. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
 - a. Black finish, unless otherwise indicated.
 - b. Galvanized finish for exterior installations and where indicated.
 - c. Type S, Grade B, standard weight (schedule 40) unless another weight required by structural loads.
14. Gray Iron Castings: ASTM A 48, Class 30.
15. Malleable Iron Castings: ASTM A 47, grade 32510.
16. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails.
17. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
18. Nonshrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621.
19. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD- C 621.
20. Interior Anchoring Cement: Factory-prepackaged nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site. Use for interior applications only.
21. Fasteners: Provide bolts, nuts, lag bolts, machine screws, wood screws, toggle bolts, masonry anchorage devices, lock washers as required for application indicated and complying with applicable Federal standards. Hot-dip galvanize fasteners for exterior applications to comply with ASTM A 153.
22. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, universal modified alkyd primer; resistant to normal atmospheric corrosion, compatible with finish paint systems indicated, capable of providing a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.

23. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.
24. Zinc Chromate Primer: FS TT-P-645.
25. Shop Painting: Apply shop primer to surface of metal fabrications except those embedded in concrete or galvanized; comply with SSPC-PA1 and requirements indicated below:
 - a. Surface Preparation: Comply with SSPC-SP6 "Commercial Blast Cleaning" for exterior work, and with SSPC-SP3 "Power Tool Cleaning" for interior work.
 - b. Stripe paint edges, corners, crevices, bolts, welds and sharp edges.
26. Galvanizing: ASTM A 123 for fabricated and unfabricated steel products made of uncoated rolled, pressed and forged steel shapes, plates, bars and strip 0.0229 inch and thicker.
27. Galvanizing Repair Paint: High zinc dust content paint with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.
28. Fabrication, General: Use materials of size and thickness shown, or, if not shown, of required size, grade and thickness to produce strength and durability in finished product. Shop-paint all items not specified to be galvanized after fabrication.
 - a. Weld corners and seams continuously to comply with AWS recommendations. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
 - b. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
29. Rough Hardware: Furnish custom-fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes for framing and supporting and anchoring woodwork.
 - a. Galvanize, unless otherwise indicated.
30. Loose Bearing and Leveling Plates: Provide for steel items bearing on masonry or concrete, as indicated. Drill plates to receive anchor bolts.
 - a. Galvanize after fabrication.
31. Loose Steel Lintels: Fabricate from shapes and to sizes indicated.
 - a. Galvanize after fabrication.
32. Miscellaneous Framing and Supports: Provide as required to complete work and not included with structural steel framework. Fabricate of welded construction in as large units as possible; drill and tap as required to receive hardware and similar items. Include required anchors for building into other work; spaced not more than 24 inches o.c.

33. Miscellaneous Steel Trim: Fabricate to shapes and sizes as required for profiles shown; continuous welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages; coordinate assembly and installation with other work.
34. Nosings: Fabricate of shapes as indicated; miter corners and weld joints. Provide anchors 6 inches from ends of corners and 24 inches o.c.
 - a. Galvanize after fabrication.
35. Shelf and Relieving Angles: Fabricate to sizes indicated for attachment to support framing. Provide slotted holes to receive anchor bolts, spaced not more than 6 inches from ends and 24 inches o.c.
 - a. Furnish wedge-type concrete inserts complete with fasteners for securing shelf angles to cast-in-place concrete.
 - b. Galvanize shelf angles to be installed on exterior concrete.
36. Metal Bar Gratings: Produce metal bar gratings indicated per NAAMM marking system that comply with the following:
 - a. Metal Bar Grating Standard "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" published in ANSI/NAAMM A202.1 "Metal Bar Grating Manual."
 - b. Heavy Duty Metal Bar Grating Standard: "Guide Specifications for Heavy Duty Metal Bar Grating" published in NAAMM "Heavy Duty Metal Bar Grating Manual."
 - c. Welded Steel Gratings: W-15-4 (welded with bearing bars 15/16 inch o.c. and cross bars 4 inches o.c.)/bearing bar sizes as indicated.
 - d. Welded Heavy Duty Steel Gratings: W-19-4 (welded with bearing bars 1-3/16 inch o.c. and cross bars 4 inches o.c.)/bearing bar sizes as indicated.
 - e. Traffic Surface for Steel Bar Gratings: As follows:
 - (1) Plain.
 - (2) Serrated.
 - (3) Knurled.
 - (4) Applied abrasive finish consisting of aluminum oxide aggregate in an epoxy resin adhesive.
 - f. Steel Finish: As follows:
 - (1) Shop prime paint applied in accordance with manufacturer's standard practice.
 - (2) Hot-dip galvanized with a coating weight of not less than 1.8 oz. per sq. ft. of coated surface.
37. Steel Pipe Railings: Fabricate to dimensions shown, with smooth bends and welded joints using steel pipe of diameter and finish indicated. Secure posts and rail ends to building construction as indicated.
 - a. Galvanize exterior steel railings, including pipe, fittings, brackets, fasteners and other ferrous metal components.
 - b. Provide steel pipe with black finish for interior railings, primed after fabrication.

38. Pipe Bollards: Fabricate pipe bollards from Schedule 80 steel pipe. Cap bollards with 1/4 inch minimum thickness steel base plate.
- a. Fabricate sleeves for bollard anchorage from steel pipe with 1/4 inch thick steel plate welded to bottom of sleeve.

B. Execution:

- 1. Installation: Perform cutting, drilling and fitting required for installation; set work accurately in location, alignment and elevation, measured from established lines and levels. Provide anchorage devices and fasteners where necessary for installation to other work.
 - a. Set loose items on cleaned bearing surfaces, using wedges or other adjustments as required. Solidly pack open spaces with bedding mortar, consisting of 1-part portland cement to 3-parts sand and only enough water for packing and hydration, or use commercial non-shrink grout material.
 - b. Touch-up shop paint after installation. Clean field welds, bolted connections and abraded areas, and apply same type paint as used in shop. Use galvanizing repair paint on damaged galvanized surfaces.

END OF SECTION 05500