

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide metal fabrications shown or specified.
2. This section includes the following:
 - a. Steel ladders.
 - b. Egress stairs.
 - c. OSHA industrial stairs.
 - d. Loose bearing and leveling plates.
 - e. Loose steel lintels.
 - f. Steel framing and supports for overhead doors.
 - g. Steel framing and supports for mechanical and electrical equipment.
 - h. Steel framing for openings in the roof.
 - i. Steel framing for wall openings.
 - j. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - k. Metal angle and channel edgings.
 - l. Floor pit and trench edge angles.
 - m. Miscellaneous metal trim.
 - n. Rolled shape steel door frames.
 - o. Metal floor plate and supports.
 - p. Extruded nosings and treads.
 - q. Pipe guards.
 - r. Wheel guards.
 - s. Pipe bollards.
 - t. Gratings.
 - u. Pipe railings.
 - v. Highway type guardrails.

B. Related Work Specified in Other Sections

1. Cast Iron Trench Drains and Grates – Division 3.
2. Structural Steel – Division 5.

C. Products Furnished, But Not Installed Under This Section

1. Metal fabrications, and anchors for same, for embedment in concrete.

D. Related Work Performed Under Other Contracts

1. Structural Steel - Structural Steel Contract.

1.2 PERFORMANCE REQUIREMENTS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Material Isolation: Where aluminum comes in contact with concrete, masonry, or dissimilar metals, the materials shall be kept from direct contact by use of a membrane separator such as tarred building paper or a heavy coat of alkali resistant bituminous paint as approved by the Architect-Engineer, applied as received from the manufacturer. This paint shall be allowed to dry before assembly.

1.3 SUBMITTALS

- A. Furnish submittals for items that are identified in this Section by a different typeface and a bracketed code (e.g., *Item [L]*). Refer to Division 1 General Requirements for definition of codes for types of submittals and the administrative requirements governing submittal procedure. Additional submittal requirements pertaining to this Section are specified under this Article.
- B. Submit detailed shop drawings when specified, to show compliance with the design intent.
- C. Metal Fabrications Materials: Submit Letter of Compliance for materials and products specified.
- D. Qualified Welder Certificates: Submit to the Owner's Representative for each welder, from accredited, independent testing laboratory, per AWS D1.1.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm having the experience in the type and quantity of metal fabrications to be fabricated and installed and have construction records indicating success in performance capacity, quantity, quality and safety.
- B. Welds shall be certified for procedures to be performed in accordance with AWS D1.1 "Structural Welding Code – Steel", AWS D1.3 "Structural Welding Code – Sheet Steel", and AWS D1.2 "Structural Welding Code – Aluminum".
- C. Shop Inspection: Grant the Owner's Representative access for inspection purposes to any and all parts of the shop where work under this Section is being fabricated.
- D. Grating shall be designed, manufactured and installed in compliance with ANSI/NAAMM MBG 531 "Metal Bar Grating Manual" and MBG 532 "Heavy-Duty Metal Bar Grating Manual".

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take measurements at the building to assure proper fitting, fabrication, and erection of the work. Check dimensions in the field, whether or not shown, upon which the accurate fitting together and building-in of the metal fabrication work may depend or which affects the proper installation of the work of others. Indicate field dimensions on the shop drawings.
- B. Closely coordinate this work with the work of others, including construction schedule wherever this work affects or is affected by the work of others. Provide all anchors, inserts, supports, and accessories as part of this work.
- C. Fabrication from Established Dimensions: Verify with the Owner's Representative whether field dimensions will delay the construction schedule. Upon approval of the Owner's Representative, proceed with fabrication after receipt of approved shop drawings based on established dimensions without field measurement. Continue coordination of established and field dimensions until fabrications are installed. Allow extra material, if required, for field fitting and trimming.

1.6 COORDINATION

- A. Coordinate the work of this Section with the work of other trades, under this Contract or other contracts, doing adjacent or concurrent work so as to insure proper, timely, and adequate interface.
- B. Provide drawings and deliver templates, anchors, fasteners and embedded items to the site to insure proper, timely and adequate interface.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Rolled Steel Plates and Shapes: Conform to ASTM A36 for angles and plates, ASTM A36 or A572 Grade 50 for S and M shapes and channels, and ASTM A992 for W shapes.
 - 1. Where exposed to view, material and fabrication shall conform to requirements of "Specification for Architecturally Exposed Structural Steel" in Section 10 of AISC Code of Standard Practice.
- B. Bolts: High-strength heavy hex structural bolts per ASTM A325, Type 1 or 2, Plain (Galvanized for galvanized members); use heavy hex nuts per ASTM A563, Grade C plain nut (Grade DH for galvanized bolts); and use hardened steel washers per ASTM F436 plain-finished washer (Galvanized washer for galvanized bolts).
- C. Steel Pipe: Per ASTM A53, Grade B, Type E or S, Schedule 40 and 80.

- D. Steel Grating
1. Steel Grating
 - a. Rectangular bearing bars and crossbars shall conform to ASTM A 569 for hot rolled carbon steel sheet and strip.
 - b. Crossbars made of wire rods shall conform to ASTM A510 for carbon steel wire rods.
 2. Acceptable Manufacturers
 - a. Alabama Metal industries Corp., Birmingham, AL
 - b. All American Grating, Pittsburgh, PA
 - c. Barnett/Bates Corp., Joliet, IL
 - d. Fisher & Ludlow, Plymouth, MI
 - e. IKG Industries, Nashville, TN
 - f. Ohio Grating Inc., Canton, OH
 - g. Tru-Weld Grating Inc., Wexford, PA
 3. Bar grating shall be fabricated using plain rectangular steel bearing bars spaced at 1-3/16 inches on center with forge welded steel crossbars spaced 4 inches on center. Depth of bearing bars shall be determined by Registered Design Professional based on design load and span.
 4. Notching of bearing or cross bars is prohibited.
 5. Provide banding at cutouts and around perimeter of removable panels. Banding shall be same size as bearing bars.
 6. Limit weight of removable panels.
 7. Grating exposed to elements shall be galvanized.
 8. Mechanical fasteners shall be galvanized when galvanized grating is used.
- E. Galvanized Steel Bar Grating Fasteners: Use galvanized grating fasteners when galvanized grating is fastened to galvanized steel framing.
1. Hilti "FCM Fastening System".
- F. Abrasive-Surfaced Steel Floor Plate: 1/4 inch thick unless noted otherwise, with steel abrasive integral with surface of ASTM A36 steel or ASTM A 283, Grade A, steel base plate.
1. W.S. Molnar Co. "Slip-Not, Grade 2".
 2. IKG Industries "Mebac Anti-Skid Plate".
- G. Checkered Steel Plate: Raised pattern floor plates 1/4 inch thick unless otherwise noted; of ASTM A 36 steel:
1. Ryerson "Inland 4-Way Floor Plate".
 2. U.S. Steel "Multigrip Floor Plate".
 3. Central Steel "Four Way Steel Floor Plate".
- H. Tubing: Cold formed shapes per ASTM A 500, Grade B.
- I. Highway-type Guide Rails: 10 gage steel. Galvanize rail sections and all fasteners.
1. Armco Steel Corp. "Flex-Beam".
 2. Syro Steel Corp. "Protecto-Ohio".

- J. Expansion Bolts:
1. Manufacturer:
 - a. Hilti “Kwik Bolt”.
 - b. Rawl “Rawl-Stud”.
 - c. Red Head “Wedge Anchors”.
 2. Anchor bolts and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - a. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - b. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).
- K. Epoxy Capsule Type Anchors: 2 part, threaded steel stud and epoxy adhesive filled capsule anchoring system. Install per manufacturer’s recommendations.
1. Hilti “HVA Adhesive Anchor”.
- L. Threaded Type Concrete Insert:
1. Heckmann Building Products, Inc. “No. 444 Star Threaded Insert”.
 2. Hohmann & Barnard, Inc. “Malleable Iron Threaded Insert No. HF”.
 3. Richmond Screw Anchor Co. “Kohler Threaded No. UST 634”.
- M. Prime Paint on Carbon Steel: Rust-inhibitive non-lead type.
1. Shop Primer for Ferrous Metal: Rust-inhibitive, lead- and chromate-free, modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
 2. Preferred shop primers are:
 - a. Bruder 24-A-167 Gray.
 - b. Carboline AD-29 Gray.
 - c. Con-Lux Rust Arrestor 43 Gray.
 - d. DuPont 65-Y-3055.
 - e. Rust-Oleum 7086 Gray.
 - f. Sherwin Williams E61A45 Gray.
 - g. Tnemec 10-1009 Gray.
 3. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
 - a. Manufacturer:
 - 1) The Sherwin-Williams Company, “Corothane I GalvaPac Zinc Two Pack Primer B65G10/B69D210”.
 - 2) The Sherwin-Williams Company, “Zinc Clad III HS B69A100/B69V100/B69D11”.
 - 3) Carboline Company, “Carboline 621”.
 - 4) PPG Industries, Inc., “Aquapon Zinc-Rich Primer 97-670.

5) Tnemec Company, Inc., “Tnemec-Zinc 90-97”.

- N. Touch-up Paint on Galvanized Steel: Organic zinc-rich primer per SSPC-Paint 20:
1. The Sherwin-Williams Company, “Corothane I GalvaPac Zinc Two Pack Primer B65G10/B69D210”.
 2. Carboline Co., “Carboline 621”.
 3. PPG Industries, “Aquapon Zinc-Rich Primer 97-670”.
 4. Tnemec “Tneme-Zinc 90-97”.

O. Aluminum:

1. Extruded Bars, Rods, Shapes and Tubes. ASTM B 221, 6063 alloy.
2. Structural Shapes: ASTM B 221, 6061 alloy.
3. Flat Sheet and Plate: ASTM B 209, 1100, 3003 or 5052 alloy.
4. Extruded Pipe: ASTM B 241, 6063 alloy.
5. Fasteners: 2024 alloy for screws and 6061 for rivets.

2.2 FABRICATION

A. Connections And Workmanship

1. Fabricate and install the items per:
 - a. AISC “Specifications for the Design, Fabrication & Erection of Structural Steel for Buildings”.
 - b. AISC “Code of Standard Practice for Steel Buildings and Bridges”.
 - c. AISC “Specification for Architecturally Exposed Structural Steel”.
 - d. AISC “Manual of Steel Construction”.
 - e. AWS “Structural Welding Code”, AWS D1.1.
2. Make detail pieces with all projecting corners clipped and filler pieces welded flush.
3. Bolt or weld shop and field connections, unless otherwise noted or specified. Provide clips, lugs, brackets, straps, plates, bolts, nuts, washers and similar items, required for complete fabrication and erection. Use connections of type and design required by forces to be resisted, and to provide secure fastening.
4. In bolting, draw up bolts or nuts tight. Use bolts of lengths required so that bolts do not project more than 1/4 inch beyond face of nut. Provide high-strength hexagonal head bolts with washers and hexagonal nuts.
5. Maximize shop preassembly of fabricated items.
6. Provide beam connections that comply with AISC standard 2 angle web connections that support 75% of the total uniform load capacity of the beam. Connections with angles bolted to the web shall meet the shear requirements for friction bolting and bearing type bolts per AISC specification Section 1.5.1.2.2.
7. Remove burrs from sheared and punched metal.
8. Provide air vents with punched 1 inch (25 mm) holes at 24 inches on center in all channels, angles, and plates embedded in concrete to vent trapped air produced when vibrating concrete in place..
9. Bend metal edges to the minimum radius without causing metal separation at the bent edge.
10. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated.

11. Weld seams and corners with continuous welds using methods that minimize distortion of members. Remove flux. Grind welds exposed in the finish work smooth, flush with adjacent surfaces, filleted at angular connections unless otherwise specified.
12. Drill, tap and reinforce fabrications to receive bolts and hardware for connection.
13. For exterior work, fabricate joints and connections to exclude water. Provide weep holes to drain moisture from precipitation or condensation
14. Provide connections that prevent bending, buckling or overstressing of the members based on a temperature range of 180 degrees F for the metal surfaces.
15. Remove sharp edges in pedestrian walk areas.
16. Provide exposed connections with flush, tight joints. Use exposed fasteners only as indicated and concealed fasteners wherever possible. Locate joints at concealed locations wherever possible
17. Provide holes required for the connection of other adjacent or adjoining work wherever holes are noted or can be determined prior to fabrication of the steel. Locate holes for bolting equipment to supports to a tolerance of plus or minus 1/16 inch of dimensions indicated.
18. Furnish members true to length so that assembling may be done without fillers, except where same are required or detailed. Trim projecting edges or corners flush where different members are assembled. Items shall be free from twists, bends, and open joints.
19. Fabricate members to a tolerance per AISC Code of Standard Practice.
20. Use welded studs for connections to tubing members in lieu of drilled and tapped holes.
21. Seal ends of tubing either by welding completely around where joining other members or by welding in a 3/16 inch plate at open ends.
22. Tag miscellaneous iron and steel, including anchor bolts, sleeves, and bases or otherwise mark for ease of identification at the project site.
23. Fit work together in the fabrication shop and deliver complete, or in parts, ready to be set in place.
24. Welding of aluminum work shall be done by the inert-gas metal-arc torch tungsten-arc torch or other specialized welding as approved by the Architect-Engineer.

2.3 FINISHES

A. General

1. Reference: NAAMM "Metal Finishes Manual for Architectural Metal Products" for application of finishes.
2. Assemble metal fabrications before finishing.

B. Galvanizing

1. Apply galvanizing after built-up members are completely fabricated. After galvanizing, ream holes to proper size and re-tap threads. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damage to galvanized surfaces with zinc-rich galvanized touch-up paint specified.
2. Galvanize: Members specifically noted on the Drawings or specified as galvanized.
 - a. Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strips: Per ASTM A123; average weight of zinc coating per square foot of actual surface, for 3/16 inch and less thickness members 2.0 ounces, for 1/4 inch and heavier members 2.3 ounces.

- b. Iron and Steel Hardware: Per ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface per Table 1 of ASTM A153, for the various classes of materials used on the Project.
 - c. Steel Sheet: Per ASTM A653; weight of zinc coating, per square foot on both sides of sheet, Coating Designation G90, minimized spangle and chemically treated.
- C. Shop Prime Painting
 - 1. Clean interior ferrous metals to be shop primed by power tool cleaning per SSPC-SP3 per SSPC Zone 1A.
 - 2. Clean exterior metals to be shop primed by commercial blast cleaning per SSPC-SP6/NACE No. 3 per SSPC Zone 1B.
 - 3. Shop paint ferrous metal 1 coat of priming paint, minimum 2.5 mils dry film thickness per SSPC-PA1, except that those surfaces in contact after assembling, and members embedded in concrete or masonry, need have no paint. Shop paint surfaces not in contact, but inaccessible after assembly, a second coat of priming paint before assembling. Allow surface to thoroughly dry before primer paint is applied.
 - a. Do not shop prime paint items specified or noted to be galvanized.
 - b. Do not shop prime paint members that are to receive spray-on fireproofing.
 - 4. Stripe paint corners, crevices, bolts, welds and sharp edges.
- D. Aluminum Finishes
 - 1. Provide aluminum finishes as designated by the Aluminum Association (AA).
 - 2. Fabricated Finish: AA-M10 (mill finish).
 - 3. Clear Anodic Finish: (Class I) AA-M12C22A41.

2.4 STEEL FRAMES

- A. *Steel Frames [D]*: Furnish for doors, hatches, grilles and other openings, fabricated from structural shapes and not indicated as part of the Structural Steel (Work) (Contract).
- B. Fabricate frames from rolled steel sections or rolled steel sections and steel plate, and provide connections and anchors for building into adjoining materials. Select sections for trueness of web and flange. Straighten members as required so that the finished frames are uniform, square and true throughout the length and depth of the assembled units.
- C. Connect built-up members of frames by welding. Miter or cope and join members with continuous welding beads. Provide and weld solid steel bar stops, spacers, and fillers to frames as indicated. Provide frames with temporary spreader bars to prevent springing frames out of shape prior to and during erection.
- D. Frames for floor openings shall be of sizes indicated and so fabricated that top of frame and frame insert of plate or bar grating are flush with finish floor.

2.5 STEEL CURBS AND SILLS

- A. *Steel Curbs and Sills [D]*: Fabricate from structural steel shapes and steel plates. Where curbs extend around corners, butt or miter, and join the members by continuous welding bead. Grind

welding beads upon which covers or other members bear, and exposed welding beads, smooth and flush. Round exposed edges of members by grinding.

2.6 DOOR FRAMES

- A. Steel door frames and associated items which are shown or noted as miscellaneous metal work shall be as indicated and fabricated with heads and jambs of structural shapes, plates, etc., according to typical details. All corners shall be square and true. Weld all exposed joints and grind flush and smooth. Provide anchors on frames to be set in masonry or concrete. Unless otherwise shown or specified herein, cut holes in channel jambs to receive latch bolts and/or dead bolts for door locks and latches. Fit door frames with bar stops as shown or noted and plug weld to frame.
- B. All steel door frames for fire doors shall conform to the underwriter's requirements and shall have joints formed by extending head members over jambs and securely fastened by a continuous weld.
- C. Frames for overhead doors shall have jamb members extended upward for mounting tracks and securing frames as shown, noted and as required by the door installation.
- D. Cut back jamb channels, extend up and connect to girts above, where and as shown or noted.
- E. For each freight elevator hoistway door opening, provide metal sills and steel channel door frames with jambs from floor to door head and extended upward and connected to the building construction above. The frames and sills shall be plumb and in alignment with frames and sills of the other openings in the hoistway. Door sills shall be made of ¼ inch thick abrasive surfaced steel floor plate by one of the manufacturers listed below, or similar material approved by the Architect-Engineer.
 - 1. IKG Industries, "Mebac Floor Plate".
 - 2. Safe Walk Inc., "Algrip".

2.7 ANCHORS

- A. Anchors: Furnish for frames, curbs, sills, and other miscellaneous metal members shown anchored into concrete or masonry. Fabricate anchors from strap iron bent to shape or use weldable headed studs, welded to backs of members, extended with bent or head end for building-in as conditions require, of sizes and spacing as noted. Where size and spacing are not noted, furnish 1-1/2 inch wide by 1/4 inch thick by 8 inches long size anchors for concrete and 1-1/2 inch wide by 1/8 inch thick by 8 inches long size anchors for masonry. Space masonry anchors to fit the jointing of the adjacent masonry work. Unless otherwise noted, space anchors at 36 inches or less on centers.
- B. Where anchors and plates or clips are to be built-in for attachment of later work, provide bolts in the plates or clips, welded to back, with threaded ends extended as required.
- C. For attaching work to masonry or concrete, where anchors or inserts cannot be built-in, provide specified expansion anchors and machine bolts or screws.

2.8 LADDERS

- A. *Fixed-rail Type Steel Ladders [D]*: Fabricate with side rails of steel flat bars of 2-1/2 inches by 1/2 inch size spaced 20 inches apart, unless other size and spacing is noted. Fit 3/4 inch solid section steel bar rungs into punched holes in side rails, at 12 inches on center and weld rungs in place and grind welds smooth. Weld steel brackets to side rails, at not over 6 feet on center, to secure ladders in place.

2.9 STEEL PIPE RAILINGS

- A. *Steel Pipe Railings [D]*: Fabricate from standard weight, carbon steel pipe or of round structural steel tubing. Where railing size is not noted, use members of 1-1/2 inch nominal diameter (actual 1.9 inch outside diameter). Use Schedule 80 pipe or equivalent tubing for vertical members such as posts and use Schedule 40 pipe or equivalent tubing for horizontal members such as railings. Incorporate 4 inch high toe guard where required.
- B. Perform joining of post, rails, and corners by one of the following methods:
 - 1. Use flush-type weld-on steel railing fittings, such as ells, tees and crosses for joining railing members together and use preformed flush-type weld-on railing radius elbows for railing bends and corners. Use internal splice locks/connectors for welding pieces of railings together.
 - 2. Railings may be bent at corners instead of jointing, provided the bends conform to the Drawing and are made in suitable jigs and that the cylindrical cross-section of the pipe is maintained throughout the entire bend.
- C. Where post spacing is not shown, space posts not more than 5 feet on center. Erect posts plumb in each direction.
- D. Provide concrete anchorage for posts by means of pipe sleeves set into the concrete. Sleeves shall be galvanized, standard weight, steel pipe, of inside diameter approximately 1/2 inch more than outside diameter of post, not less than 6 inches long, and having a steel plate closure secured to the bottom of the sleeve. Steel wedge posts into sleeves, and fill space between post and sleeve solid with a quick-setting hydraulic cement.
- E. Provide steel anchorage for posts by welding to the steel supporting members.
- F. Provide removable sections of handrail with posts set in close-fitting sleeves with tapped holes at third points on sleeve circumference and Allen head set screws for securing posts to sleeves.
- G. Fabricate wall railings with wall brackets for intermediate support and wall return fittings at ends. Brackets and end fittings shall be of steel and shall be of proper height to provide 1-1/2 inch clear space between wall and railing. Provide brackets at not over 5 feet on center. Anchorage to walls shall be by bolting through the bracket flange into the wall construction.

2.10 SAFETY CHAINS

- A. *Safety Chains [D]*: Fabricate of galvanized, welded type, proof coil steel chain, 3/16 inch nominal diameter, with not less than 10 links per foot, proof loading of not less than 1,000 pounds, complete with snap fasteners on each end and eye bolts for attachment. Snap fasteners shall be boat type with strength equal to the chain proof loading. Eye bolts shall be 3/8 inch bolt with 3/4 inch eye inside diameter and complete with 1/8 inch thick fastening plate. Provide chains 6 inches longer than guarded opening.

2.11 STEEL STAIRS

- A. *Steel Stairs [D]*: Construct to support a uniformly distributed live load of 100 pounds per square foot, in addition to the dead load, with a safety factor of 5, but never of less strength than to carry safely a moving concentrated load of 1,000 pounds. Provide steel framing, hangers, columns, struts, clips, brackets, bearing plates, and other components required for the support of stairs and platforms.
- B. *Stringers*: Provide of structural steel shapes. Close exposed ends of stringers with plates; continuously weld and grind joints smooth. Closures, covers, or filler plates shall be provided and placed between stair stringers and walls where and as shown. If not shown, provide loose 20 gauge sheet metal angles 1 inch x 4 inch for field installation. To be trimmed and installed with 1 inch leg facing down against wall using caulk/adhesive at wall and as bond to horizontal stringer surface.
- C. *Platform*: Construct of structural steel channel headers and structural steel framing members. Connect headers to stringers and framing members to stringers and headers. Bolts may be used only where concealed in the finish work.
- D. Provide treads and landing platforms for stairs. Treads shall be complete with supporting brackets with brackets designed to be welded or bolted to stringers unless otherwise noted. Platforms shall be designed for welding to platform framing unless otherwise noted.
 - 1. Fabricate pan type treads, landings and risers from not less than 12 gage, uncoated, hot-rolled, carbon steel of structural quality, per ASTM A 570, Grade 30. Form riser and subtread pans to profile indicated. Provide 3 inch wide cast iron abrasive safety nosings with rounded no-lip edge, complete with anchors for embedment in cement fill, of length equal to width of tread or landing, as follows:
 - a. American Safety Tread Co. "820".
 - b. Safe-T-Metal Co. "BF Nosing".
 - c. Wooster Products, Inc. "120".
 - 2. Fabricate bar grating treads and landings of bar grating. Treads shall be standard prefabricated product of grating manufacturers specified, welded or bolted into place, complete with non-slip type safety nosings. Construct landings of regular bar grating panels; provide non-slip abrasive type safety nosing at landing edge, toe plate at other open sided edges and end-banding bars at all other edges.
 - 3. Fabricate floor plate treads and landings, of steel checkered plate specified under materials, bent to profile shown and with back edge stiffener on treads.

- E. Provide railings for stairs, as previously specified in the article “STEEL PIPE RAILINGS”.
- F. Use welding for joining pieces together, except as otherwise noted. Bolts or similar fastenings shall not appear on finish surfaces. Make joints true and tight, and connections between parts light-tight. Welds shall be continuous and ground smooth. Fabricate stair work to be in line, plumb, square, true, and level. Runs shall register level with floor and platform levels.

2.12 PIPE GUARD POSTS

- A. *Pipe Guard Posts [D]*: Fabricate of diameter noted, using standard weight carbon steel pipe or structural steel tubing. Provide flanged welded-on base plates for bolted-in-place posts. Provide sleeves, with base plates, for posts noted to be removable; provide holes, at third points on the circumference of the sleeve and post,, and insert removable steel through-pins for securing of posts in sleeves.
 - 1. Provide yellow, low density polyethylene thermoplastic pipe guard post sleeves 0.25 inch nominal thickness to fit diameters and lengths of pipe guard posts indicated on the drawings.
 - a. Ideal Shield, “Bumper Post Sleeve”

2.13 BAR GRATING

- A. *Bar Grating [D]*: Provide for use at catwalks, platforms, ladders, trenches and elsewhere as shown, of welded construction. No notching of bearing or cross bars permissible. For conditions shown on the Drawings, grating shall support a uniform load of 100 pounds per square foot. Band cut grating edges; use same size bars as bearing bars.

2.14 FLOOR PLATE

- A. Shearing, cutting, or punching shall leave clean, true lines and surfaces. Floor plate shall be fastened in place by welding or bolting unless otherwise noted. Removable floor plate must be bolted. Bolts shall conform to ASTM A 325, countersunk.
 - 1. Use specified abrasive-surfaced floor plate where specifically noted.

2.15 HIGHWAY-TYPE GUIDE RAILS

- A. *Highway-type Guide Rails [D]*: Provide on steel posts, complete with flared end sections, in the locations and to the extent shown. Steel posts shall be of size noted.
 - 1. Galvanize exterior posts.

2.16 MISCELLANEOUS FRAMING

- A. Fabricate miscellaneous steel framing and supports that do not form a part of the structural steel framework or that are not indicated to be furnished under the Structural Steel (Work) (Contract). Use structural steel plates, shapes, bars and tubing of sizes and arrangement shown.

2.17 GROUT

- A. Metallic, Non-Shrink Grout: Ferrous aggregate grout per ASTM C 1107 for heavy loading applications.
- B. Non-Metallic, Non-Shrink Grout: Nonstaining, noncorrosive grout per ASTM C 1107 for interior and exterior applications.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Fabricate items that are to be built into masonry or concrete and deliver to project site for setting; furnish items complete with bolts, anchors, clips, etc., ready to set. Furnish, completely install and connect other items. Erect items to proper lines and levels, plumb and true, and in correct relation to adjoining work. Parts shall be secured in a rigid and substantial manner using concealed connections whenever practicable.
- B. Where necessary to secure work to the structure by means of expansion bolts, cinch anchors, and similar connections, do the work of laying out and installing such connections, installing the work and bolting up, unless otherwise noted. Drill or core holes in concrete and masonry work.
- C. Plumb and true the vertical members to a tolerance per AISC Code of Standard Practice. Level the horizontal members that support equipment, walkways, etc., to a tolerance per AISC Code of Standard Practice. Install such work flush with existing members where required.
- D. Provide bolts, shims, blocks, nuts, washers, wedging pieces, etc., required for complete installation, unless otherwise noted.
- E. Drill field holes for bolts or rivets. Do not burn holes.
- F. Furnish fitting-up bolts, drift pins, other tools and equipment and do necessary reaming of unfair holes found in field connections. New holes or enlargement of unfair holes by use of cutting torch is cause for rejection of the entire member. Replacement shall be made at Contractor's expense.
- G. Perform cutting, drilling, and fitting required for the installation of miscellaneous metals work. When required, fit work in place before fastening.
 - 1. Burning of holes or flame cutting of parts will not be permitted, except on prior written permission of the Owner's Representative.
 - 2. Where shoring is required, provide supports with sufficient cribbing to spread the load to members capable of supporting the load. If the immediate construction cannot support the shoring, shore the loads between floors adequately to transfer loads to the first floor slab.

- H. Field welds shall be approved by Owner's Representative before prime painting. Slag shall be cleaned from welds prior to inspection by the Owner's Representative.
 - 1. Protect Owner's personnel during welding in occupied areas.
- I. Adjust railings prior to securing in place to insure proper matching at butting joints and correct alignment throughout their length.
- J. Provide 2 safety chains at man openings in guard railings, and elsewhere as indicated; place top chain at no less than 36 inches above floor elevation and second chain 24 inches above floor elevation, unless otherwise noted.
- K. Install steel posts for highway-type guide rails at 6 feet 3 inches or 12 feet 6 inches on center unless otherwise noted, and as required to suit lengths of runs. Set posts in concrete. Bolt rails to posts, including flared end sections where required or indicated. Tighten post and splice bolts and nick the threads to prevent loosening.
- L. Set steel pipe guard posts in concrete as shown, and fill posts with concrete formed to a dome shape at top of pipe.

3.2 SETTING, BEARING AND LEVELING PLATES

- A. Clean concrete steel and masonry bearing surfaces.
- B. Set bearing and leveling plates on wedges, shims or leveling nuts. Tighten anchor bolts after members have been positioned and plumbed. Cut shims flush with bearing plates. Pack with grout.

3.3 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. Install framing and supports as indicated on shop drawing and per manufacturer's requirements and instructions.
- B. Rigidly brace with additional members if necessary supports for operable partitions and ceiling hung toilet partitions

3.4 TOUCH-UP

- A. Clean painted and galvanized surfaces after installation. Touch-up shop-primed surfaces damaged during shipment and erections. Use same paint as used in the shop. Apply minimum 2.5 mil film thickness. On galvanized surfaces, touch-up damaged galvanizing with specified zinc-rich galvanizing touch-up paint.

END OF SECTION

Revision History	
Date	Rev. No.
A	0
B	0
C	0
D	0
E	0
F	0
02-19-09	0

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