

SECTION 05500

MISCELLANEOUS METAL

07/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (1980; R 1993) Designation System for Aluminum Finishes

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.3 (1992) Ladders - Fixed - Safety Requirements

ANSI MH28.1 (1982) Design, Testing, Utilization, and Application of Industrial Grade Steel Shelving

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36 (1996) Carbon Structural Steel

ASTM A 53 (1996) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 283 (1993a) Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A 467 (1993) Machine and Coil Chain

ASTM A 475 (1995) Zinc-Coated Steel Wire Strand

ASTM A 500 (1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 653 (1996) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 924 (1996a) Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM B 26 (1996a) Aluminum-Alloy Sand Castings  
ASTM B 221 (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes  
ASTM B 429 (1995) Aluminum-Alloy Extruded Structural Pipe and Tube  
ASTM D 2047 (1993) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine  
ASTM F 1267 (1991) Metal, Expanded, Steel

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (1995) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-344 (Rev B) Lacquer, Clear Gloss, Exterior, Interior

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531 (1993) Metal Bar Grating Manual

NAAMM MBG 532 (1988) Heavy Duty Metal Bar Grating Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211 (1992) Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Miscellaneous Metal Items; FIO.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates.

SD-14 Samples

Miscellaneous Metal Items; FIO.

Samples shall be full size, taken from manufacturer's stock, and shall be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

### 1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123, ASTM A 653, or ASTM A 924, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

### 1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

### 1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

### 1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

### 1.7 ALUMINUM FINISHES

Unless otherwise specified, aluminum items shall have anodized finish. The thickness of the coating shall be not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45. Items to be anodized shall receive a polished satin finish. Aluminum surfaces to be in contact with plaster or concrete during construction shall be protected with a field coat conforming to CID A-A-344.

## 1.8 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

## PART 2 PRODUCTS

### 2.1 ACCESS DOORS AND PANELS

Doors and panels shall be flush type unless otherwise indicated. Frames for access doors shall be fabricated of not lighter than 1.52 mm (16 gauge) 16 gauge steel with welded joints and finished with anchorage for securing into construction. Access doors shall be a minimum of 350 by 500 mm 14 by 20 inches and of not lighter than 1.9 mm (14 gauge) 14 gauge steel, with stiffened edges, complete with attachments. Access doors shall be hinged to frame and provided with a flush face, screw driver operated latch. Exposed metal surfaces shall have a baked enamel finish.

### 2.2 CORNER GUARDS AND SHIELDS

Corner guards and shields for jambs and sills of openings and edges of platforms shall be steel shapes and plates anchored in masonry or concrete with welded steel straps or end weld stud anchors. Corner guards for use with glazed or ceramic tile finish on walls shall be formed of 1.6 mm 0.0625 inch thick corrosion-resisting steel with polished or satin finish, shall extend 1.5 m 5 feet above the top of cove base or to the top of the wainscot, whichever is less, and shall be securely anchored to the supporting wall. Corner guards on exterior shall be galvanized.

### 2.3 DOOR GUARDS

Door guards shall be constructed of woven steel wire or expanded metal framed with structural steel shapes. Expanded metal guards shall be of 38 mm 1-1/2 inch No. 10 mesh, welded to 25 by 25 by 3 mm 1 by 1 by 1/8 inch angle frame. Woven-wire panel shall be of 10 gauge, 38 mm 1-1/2 inch mesh secured through weaving to 25 mm 1 inch channel frame or around a 10 mm 3/8 inch round bar frame. Corners of frames shall be mitered and welded. Guards shall be sized as indicated.

### 2.4 PIPE GUARDS

Pipe guards shall be heavy duty steel pipe conforming to ASTM A 53, Type E or S, weight STD, black finish.

### 2.5 DOWNSPOUT BOOTS

Downspout boots shall be cast iron with receiving bells sized to fit downspouts.

## 2.6 EXPANSION JOINT COVERS

Expansion joint covers shall be constructed of extruded aluminum with anodized satin finish for walls and ceilings and with standard mill finish for floor covers and exterior covers. Plates, backup angles, expansion filler strip and anchors shall be designed as indicated.

## 2.7 FLOOR GRATINGS AND FRAMES

Carbon steel or Aluminum (as required by the task order) grating shall be designed in accordance with NAAMM MBG 531 or NAAMM MBG 532] to meet the indicated load requirements. Edges shall be banded with bars 6 mm 1/4 inch less in height than bearing bars for grating sizes above 19 mm. 3/4 inch. Banding bars shall be flush with the top of bearing grating. Frames shall be of welded steel construction finished to match the grating. Floor gratings and frames shall be galvanized after fabrication.

## 2.8 FLOOR PLATES

Floor plates shall be 6 mm 1/4 inch thick, slip-resistant, carbon steel conforming to ASTM A 283 having a minimum static coefficient of friction of 0.50 when tested in accordance with ASTM D 2047. Wearing surface shall be aluminum oxide or silicon carbide.

## 2.9 HANDRAILS

Handrails shall be designed to resist a concentrated load of 890 N (200 pounds) 200 pounds in any direction at any point of the top of the rail or 292 Newtons per meter (20 pounds per foot) 20 pounds per foot applied horizontally to top of the rail, whichever is more severe.

### 2.9.1 Steel Handrails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53 or structural tubing conforming to ASTM A 500, Grade A or B of equivalent strength. Steel railings shall be 40 mm 1-1/2 inch nominal size. Railings shall be hot-dip galvanized and shop painted. Pipe collars shall be steel.

a. Joint posts, rail, and corners shall be fabricated by one of the following methods:

(1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 10 mm 3/8 inch hexagonal recessed-head setscrews.

(2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 150 mm 6 inches long.

(3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

- b. Removable sections, toe-boards, and brackets shall be provided as indicated.

#### 2.9.2 Aluminum Handrails

Handrails shall consist of 40 mm 1-1/2 inch nominal Schedule 40 pipe ASTM B 429. Railings and pipe collars shall be anodized. All fasteners shall be Series 300 stainless steel.

- a. Jointing shall be by one of the following methods:

- (1) Flush type rail fittings, welded and ground smooth with splice locks secured with 10 mm 3/8 inch recessed head setscrews.

- (2) Mitered and welded joints, made by fitting post to top rail and intermediate rail to post and corners, shall be groove welded and ground smooth. Splices, where allowed by the Contracting Officer, shall be butted and reinforced by a tight fitting dowel or sleeve not less than 150 mm 6 inches in length. Dowel or sleeve shall be connected to one side of the splice by tack welding or by using epoxy cement.

- (3) Railings shall be assembled using slip-on aluminum-magnesium alloy fittings for joints. Fittings shall be fastened to pipe or tube with 6 mm 1/4 inch or 10 mm 3/8 inch stainless steel recessed head setscrews. Assembled railings shall be provided with fittings only at vertical supports or at rail terminations attached to walls. Expansion joints shall be at the midpoint of panels. A setscrew shall be provided in only one side of the slip-on sleeve. Alloy fittings shall conform to ASTM B 26.

- b. Removable sections, toe-boards and brackets shall be provided where indicated, using flange castings as appropriate.

#### 2.10 LADDERS

Ladders shall be galvanized steel or aluminum, fixed rail type in accordance with ANSI A14.3.

#### 2.11 MIRROR FRAMES

Frames for plate glass mirrors larger than 450 by 750 mm 18 by 30 inches shall be fabricated from extruded aluminum with anodized finish or corrosion-resisting steel with satin finish as required by the Task Order. Frames shall be provided with concealed fittings and tamperproof mountings.

#### 2.12 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

#### 2.13 ROOF SCUTTLES

Roof scuttles shall be of aluminum or galvanized steel not less than 2.0 mm (14 gauge), 14 gauge, with 75 mm 3 inch beaded flange welded and ground at corners. Scuttle shall be sized to provide minimum clear opening of 940 by

760 mm. 37 by 30 inches. Cover and curb shall be insulated with 25 mm 1 inch thick rigid insulation covered and protected by aluminum sheet or galvanized steel liner not less than 0.55 mm (26 gauge). 26 gauge. The curb shall be equipped with an integral metal cap flashing of the same gauge and metal as the curb, full welded and ground at corners for weathertightness. Scuttle shall be completely assembled with heavy hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles on inside and outside and neoprene draft seal. Fasteners shall be provided for padlocking on the inside. The cover shall be equipped with an automatic hold-open arm complete with handle to permit one hand release.

#### 2.14 SAFETY CHAINS

Safety chains shall be galvanized welded steel, proof coil chain tested in accordance with ASTM A 467, Class CS. Safety chains shall be straight link style, 5 mm 3/16 inch diameter, minimum 39 links per meter (12 links per foot) 12 links per foot and with bolt type snap hooks on each end. Eye bolts for attachment of chains shall be galvanized 10 mm 3/8 inch bolt with 19 mm 3/4 inch eye, anchored as indicated. Two chains shall be furnished for each guarded opening.

#### 2.15 SAFETY NOSING

Safety nosings shall be of cast iron with cross-hatched, abrasive surface. Nosing shall be 75 mm 3 inches wide and terminating at not more than 150 mm 6 inches from the ends of treads, except nosing for metal pan cement-filled treads shall extend the full length of the tread. Safety nosings shall be provided with anchors not less than 19 mm 3/4 inch long. Integrally cast mushroom anchors are not acceptable.

#### 2.16 SHELVING

Shelving shall conform to ANSI MH28.1 and shall be bolted open or closed. Minimum dimensions and number of shelves shall be as indicated.

#### 2.17 STEEL STAIRS

Steel stairs shall be complete with structural or formed channel stringers, metal pan cement-filled treads, landings, columns, handrails, and necessary bolts and other fastenings as indicated. Structural steel shall conform to ASTM A 36. Stairs and accessories shall be galvanized. Risers on stairs with metal pan treads shall be deformed to form a sanitary cove to retain the tread concrete. Integral nosings shall have braces extended into the concrete fill. Gratings for treads and landings shall conform to NAAMM MBG 531. Grating treads shall have slip-resistant nosings.

#### 2.18 STEEL DOOR FRAMES

Steel door frames built from structural shapes shall be neatly mitered and securely welded at the corners with all welds ground smooth. Jambs shall be provided with 50 by 6 by 300 mm 2 by 1/4 by 12 inch bent, adjustable metal anchors spaced not over 760 mm 2 feet 6 inches on centers. Provision shall be made to stiffen the top member for all spans over 900 mm. 3 feet. Continuous door stops shall be made of 38 by 16 mm 1-1/2 by 5/8 inch bars.

#### 2.19 TRENCH COVERS, FRAMES, AND LINERS

Trench covers shall be designed to meet the indicated load requirements. Trench frames and anchors shall be all welded steel construction designed to match cover. Covers shall have flush drop handles formed of 6 mm 1/4 inch round stock, and shall be cast-iron grating. Grating opening widths shall not exceed 25 mm. 1 inch. Trench liners shall be cast iron with integral frame for cover.

#### 2.20 WHEELGUARDS

Wheelguards shall be hollow, heavy duty, cast iron three quarters round, at least 450 mm 18 inches high designed to provide a minimum of 150 mm 6 inches of protection.

#### 2.21 WINDOW GUARDS, BAR GRILLE TYPE

Bar grill window guards shall be of 19 mm 3/4 inch round bars, spaced not over 100 mm 4 inches on centers vertically, and 50 by 13 mm 2 by 1/2 inch horizontal bars spaced not over 300 mm 12 inches on centers. Vertical bars shall be extended through and securely welded to the cross bars. Horizontal bars shall be extended, bent, and drilled as shown for anchorage at jambs of window openings.

#### 2.22 WINDOW GUARDS, DIAMOND MESH TYPE

Diamond mesh window guards shall be constructed of woven steel wire or expanded metal frames with hot-rolled or cold-formed steel shapes. Expanded metal conforming to ASTM F 1267 shall be of 38 mm, 1-1/2 inch, No. 10 mesh, welded to 25 by 25 by 3 mm 1 by 1 by 1/8 inch angle frame. Woven-wire panels shall be of 10 gauge, 38 mm 1-1/2 inch mesh secured through weaving bar to 10 mm 3/8 inch round or 25 mm 1 inch channel frame. Corners of frames shall be mitered and welded or mortised and tenoned. One tamperproof hasp and padlock, with access from the interior, shall be provided for each butt used.

#### 2.23 WINDOW SUB-SILL

Window sub-sill shall be of extruded aluminum alloy of size and design indicated. Not less than two anchors per window section shall be provided for securing into mortar joints of masonry sill course. Sills for banks of windows shall have standard mill finish with a protective coating, prior to shipment, of two coats of a clear, colorless, methacrylate lacquer applied to all surfaces of the sills.

#### 2.24 WINDOW WELLS

Window wells shall be not lighter than 1.5 mm (16 gauge), 16 gauge, corrugated sheet steel, hot-dip galvanized after fabrication. Top edge of walls shall have a 19 mm 3/4 inch bead or rolled top. Window wells shall be semicircular or semielliptical in form and shall overlap the window by at least 75 mm 3 inches on each side. Removable cover, hot-dip galvanized after fabrication, consisting of steel bar grate with bars spaced at not more than 50 mm 2 inch centers and welded to 25 by 6 mm 1 by 1/4 inch frame shall be designed to fit into and rest on top edge of window well.

### PART 3 EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

### 3.2 REMOVABLE ACCESS PANELS

A removable access panel not less than 300 by 300 mm 12 by 12 inches shall be installed directly below each valve, flow indicator, damper, or air splitter that is located above the ceiling, other than an acoustical ceiling, and that would otherwise not be accessible.

### 3.3 DOOR GUARD FRAME

Door guard frame shall be mounted over the glazed opening using 6 mm 1/4 inch lag bolts on the interior of wood doors or tamperproof through bolts on the interior of metal doors.

### 3.4 INSTALLATION OF PIPE GUARDS

Pipe guards shall be set vertically in concrete piers. Piers shall be constructed of, and the hollow cores of the pipe filled with, concrete specified in SECTION 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

### 3.5 INSTALLATION OF DOWNSPOUT BOOTS

Downspouts shall be secured to building through integral lips with appropriate fasteners.

### 3.6 ATTACHMENT OF HANDRAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

#### 3.6.1 Installation of Steel Handrails

Installation shall be in pipe sleeves embedded in concrete and filled with molten lead or sulphur with anchorage covered with standard pipe collar pinned to post, by means of pipe sleeves secured to masonry with expansion shields and bolts or toggle bolts, and base plates bolted to stringers or structural steel framework. Rail ends shall be secured by steel pipe flanges anchored by expansion shields and bolts.

#### 3.6.2 Installation of Aluminum Handrails

Installation shall be by means of flanges anchored to concrete or masonry by expansion shields, base plates or flanges bolted to stringers or structural steel framework, and flanges through-bolted to a back plate or by 6 mm 1/4 inch lag bolts to studs or other structural members. Bolts used to anchor aluminum alloy flanges shall be stainless steel of a size appropriate to the standard product of the manufacturer. Where aluminum or alloy fittings or extrusions are to be in contact with dissimilar metals or portland cement concrete, the contact surface shall be given a heavy coating of bituminous paint or asphalt varnish.

### 3.7 PARTITION POSTS AND OPENINGS

Posts shall be set in shoes bolted to the floor and in caps tap-screwed to clip angles in overhead construction, as indicated. Openings shall be formed using channels similar to the partition frames at ducts, pipes, and other obstructions.

### 3.8 RECESSED FLOOR MATS

Contractor shall verify field measurements prior to releasing materials for fabrication by the manufacturer. A mat frame shall be used to ensure recess accuracy in size, shape and depth. Drain pit shall be formed by blocking out concrete when frames are installed. Pit shall be dampproofed after concrete has set. Frames shall be assembled onsite and installed so that upper edge will be level with finished floor surface. A cement base shall be screeded inside the mat recess frame area using the edge provided by the frame as a guide. The frame shall be anchored into the cement with anchor pins a minimum of 610 mm 24 inches on centers.

### 3.9 MOUNTING OF SAFETY CHAINS

Safety chains shall be mounted 1070 mm 3 feet 6 inches and 610 mm 2 feet above the floor.

### 3.10 INSTALLATION OF SAFETY NOSINGS

Nosing shall be completely embedded in concrete before the initial set of the concrete occurs and shall finish flush with the top of the concrete surface.

### 3.11 DOOR FRAMES

Door frames shall be secured to the floor slab by means of angle clips and expansion bolts. Continuous door stops shall be welded to the frame or tap screwed with countersunk screws at no more than 450 mm 18 inchcenters, assuring in either case full contact with the frame. Any necessary reinforcements shall be made and the frames shall be drilled and tapped as required for hardware.

### 3.12 TRENCH FRAMES AND COVERS

Trench frames and covers shall finish flush with the floor.

### 3.13 INSTALLATION OF WHEEL GUARDS

Wheel guards shall be filled with concrete and anchored to the floor or the building according to the manufacturer's recommendations.

### 3.14 BAR-GRILLE WINDOW GUARDS

Bar-grille window guards shall be securely anchored to masonry with 13 mm 1/2 inch diameter prison-type screws or bolts and expansion shields, or other type of fastenings if the ends of such fastenings are welded to the adjoining metal grilles or otherwise made tamperproof in a satisfactory manner. Spanner-head screws or bolts are not considered prison-type fasteners.

### 3.15 DIAMOND MESH WINDOW GUARDS

Diamond mesh window guards shall be mounted on interior window frame with not less than two tamperproof hinged butts mounted on wood jambs, or exterior of window frame with not less than two tamperproof hinged butts mounted on 25 by 300 by 3 mm 1 by 12 by 1/8 inch jamb channel attached as indicated to 50 by 6 mm 2 by 1/4 inch plate anchored to wood jamb with 6 mm 1/4 inch lag bolt, to masonry jamb with toggle bolts, or to concrete jambs and solid masonry jambs with expansion shields and bolts. One additional butt shall be provided for each 900 mm 3 foot internal length of guard over 1500 mm. 5 feet. Hasp and padlock shall be installed on the jamb opposite to that hinged.

### 3.16 INSTALLATION OF WINDOW WELLS

Window wells shall be placed as shown with the walls securely anchored to foundation surface. The area within the well shall be excavated to the bottom of the well and covered with a 100 mm 4 inch thick layer of coarse gravel or crushed rock.

-- End of Section --