SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies items and assemblies fabricated from structural steel shapes, installing flattened expanded metal security screens over existing windows, complete with perimeter attachment, fasteners, continuous sill support angle, priming and finish painting, and window interior glazing obscuring film and other materials as shown and specified.

B. Items specified.

1. Support for Wall and Ceiling Mounted Items: (SD055000-01, SD055000-02, SD102113-01, SD102600-01, SD123100-01 & SD123100-02)
2. Frames.
3. Railings.

1.2 RELATED WORK

A. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.

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

C. Stainless steel corner guards: Section 10 26 00, WALL AND DOOR PROTECTION.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data

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.
3. Provide templates and rough-in measurements as required.

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.

F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

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):

B18.6.1-97.....Wood Screws

B18.2.2-87(R2010) .....Square and Hex Nuts

C. American Society for Testing and Materials (ASTM):

A36-14.....Structural Steel

A47-99(R2014) .....Malleable Iron Castings

A48-03(R2012) .....Gray Iron Castings

A53-12.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123-15.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A240-15.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A269-15.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A307-14.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

A391-07(R2015) .....Grade 80 Alloy Steel Chain

A786-15.....Rolled Steel Floor Plate

B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B456-11.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

B632-08.....Aluminum-Alloy Rolled Tread Plate

C1107-13.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

D3656-13.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

F436-16 .....Hardened Steel Washers

F468-06(R2015).....Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws and Studs for General Use

F593-13 .....Stainless Steel Bolts, Hex Cap Screws, and Studs

F1667-15 .....Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):

D1.1-15.....Structural Welding Code Steel

D1.2-14.....Structural Welding Code Aluminum

D1.3-18.....Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)

AMP 521-01(R2012).....Pipe Railing Manual

AMP 500-06 .....Metal Finishes Manual

MBG 531-09(R2017) .....Metal Bar Grating Manual

MBG 532-09 .....Heavy Duty Metal Bar Grating Manual

F. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:

SP 1-15 .....No. 1, Solvent Cleaning

SP 2-04 .....No. 2, Hand Tool Cleaning

SP 3-04 .....No. 3, Power Tool Cleaning

G. Federal Specifications (Fed. Spec):

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

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.

B. Railings and Handrails: 900 N (200 pounds) in any direction at any point.

2.2 SECURITY SCREEN – EXPANDED METAL MESH

A. Flattened expanded steel mesh, conforming to ASTM F1267, fabricated from carbon steel sheet conforming to ASTM A1011/A1011M.

1. Style / Designation: 3/4-inch No. 9, flattened, fabricated from 10 gauge (0.135 inch / 3.4 mm) steel, as indicated on the drawings.
2. Provide mesh in the largest practical sheet sizes to minimize joints. Splices, where required, shall occur at framing members.

2.3 FASTENERS AND ANCHORS

A. Provide corrosion-resistant fasteners and anchors suitable for the substrate encountered (existing window frame, window trim, and wall head/jamb/sill framing or structure).

B. Fastener embedment / penetration:

1. Minimum 3/4 inch (19 mm) penetration into existing window frame; or
2. Minimum 1-1/2 inch (38 mm) penetration into wall framing / structure.

C. Spacing: Space fasteners at 8 inches (200 mm) on center maximum, unless closer spacing is indicated or required for the substrate.

D. Exposed fasteners shall be tamper-resistant (security) type heads.

2.4 SHOP FINISH

A. Surface Preparation: Prepare steel surfaces in accordance with SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.

B. Shop Prime: Apply one coat of rust-inhibitive metal primer to all steel surfaces in accordance with SSPC-PA 1. Prime the security screen, framing, and support angle.

C. Finish: Prime and paint steel, color white. Field-applied finish coat shall comply with Section 09 91 00, PAINTING.

D. Where indicated or where exposed to exterior conditions, hot-dip galvanize the security screen and steel supports after fabrication in accordance with ASTM A123/A123M; galvanize fasteners and hardware per ASTM A153/A153M. Repair damaged galvanizing per ASTM A780/A780M prior to priming and painting.

2.5 MATERIALS

A. Stainless Steel: ASTM A240, Type 302 or 304.

B. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.

C. Floor Plate:

1. Steel ASTM A786.
2. Aluminum: ASTM B632.

D. Steel Pipe (Bollard): ASTM A53.

1. Galvanized for exterior locations.
2. Type S, Grade A unless specified otherwise.
3. NPS (inside diameter) as shown.

E. Cast-Iron: ASTM A48, Class 30, commercial pattern.

F. Malleable Iron Castings: A47.

G. Primer Paint: As specified in Section 09 91 00, PAINTING.

H. Stainless Steel Tubing: ASTM A269, type 302 or 304.

I. Modular Channel Units:

1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
2. Form channel within turned pyramid shaped clamping ridges on each side.
3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.

J. Grout: ASTM C1107, pourable type.

K. Insect Screening: ASTM D3656.

2.6 MATERIALS

A. Structural Steel: ASTM A36.

B. Stainless Steel: ASTM A240, Type 302 or 304.

C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.

D. Floor Plate:

1. Steel ASTM A786.
2. Aluminum: ASTM B632.

E. Steel Pipe (Bollard): ASTM A53.

1. Galvanized for exterior locations.
2. Type S, Grade A unless specified otherwise.
3. NPS (inside diameter) as shown.

F. Cast-Iron: ASTM A48, Class 30, commercial pattern.

G. Malleable Iron Castings: A47.

H. Primer Paint: As specified in Section 09 91 00, PAINTING.

I. Stainless Steel Tubing: ASTM A269, type 302 or 304.

J. Modular Channel Units:

1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
2. Form channel within turned pyramid shaped clamping ridges on each side.
3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.

K. Grout: ASTM C1107, pourable type.

L. Insect Screening: ASTM D3656.

2.7 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 60,000 psi tensile strength bolts.
   c. ASTM F468 for nonferrous bolts.
   d. ASTM F593 for stainless steel.
2. Screws: ASME B18.6.1.
3. Washers: ASTM F436, type to suit material and anchorage.
4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.8 FABRICATION GENERAL

A. Material

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, riveting or bolting.
2. Field 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 rivets and 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 Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

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.
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.

g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.

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 1-1/4 by 1/8 inch steel strap anchors, 6 inches long with one inch hooked end, to back of member 2 feet on center, unless otherwise shown.

b. Where metal fabrications are shown to be built into masonry use 1-1/4 by 1/8 inch steel strap anchors, 10 inches long with 2 inch hooked end, welded to back of member at 2 feet on center, unless otherwise shown.

5. Cutting and Fitting:

a. Accurately cut, machine and fit joints, corners, copes, and miters.

b. Fit removable members to be easily removed.

c. Design and construct field connections in the most practical place for appearance and ease of installation.

d. Fit pieces together as required.

e. Fabricate connections for ease of assembly and disassembly without use of special tools.

f. Joints firm when assembled.

g. Conceal joining, fitting and welding on exposed work as far as practical.

h. Do not show rivets and screws prominently on the exposed face.

i. 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 AMP 500 Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501.
   a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
   b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
   c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
   d. Painted: AA-C22R10.
3. Steel and Iron: 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.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.
5. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.

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.

2.9 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 Ceiling Hung Toilet Stall:

1. Use a continuous steel channel above pilasters with hangers centered over pilasters.
2. Make provision for installation of stud bolts in lower flange of channel.
3. Provide a continuous steel angle at wall and channel braces spaced as shown.
4. Use threaded rod hangers.
5. Provide diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.

C. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 0.0598 inch thick.
3. Steel strip minimum of 6 inches wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 4 inches on center between ends.

D. 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.

E. For Intravenous Track and Cubical Curtain Track:
1. Fabricate assembly of steel angle as shown.
2. Drill angle bent ends for anchor screws to acoustical suspension system and angle for hanger wires.
3. Provide pipe sleeve welded to angle.

F. Supports at Ceiling for Radiographic (x-ray) Equipment:
1. Fabricate hangers braces, and track of modular channel units assembly as shown.
2. Fabricate steel plates for anchor to structure above.
3. Drill bent plates for bolting at mid height at concrete beams.

G. For Operating Room Light:
1. Fabricate as shown to suit equipment furnished.
2. Drill leveling plate for light fixture bolts.

H. Supports in Orthopedic Brace Shop:
1. Fabricate from 25 mm (one inch) steel pipe, fasten to steel angles above and extend to a point 150 mm (6 inches) below finished ceiling.
2. Lower end of the pipe shall have a standard pipe thread.
3. Provide an escutcheon plate at ceiling.

I. Supports for Accordion Partition Tracks, Exercise Equipment, and Items at Various Conditions at Suspended Ceilings:
1. Fabricate of structural steel shapes as shown.
2. Drill for anchor bolts of suspended item.

J. Supports for Communion Rail Posts in Chapel:

1. Fabricate one steel plate support for each post as shown.
2. Drill for fasteners.

2.10 FRAMES

A. Elevator Entrance Wall Opening.
   1. Fabricate of channel shapes, plates, and angles as shown.
   2. Weld or bolt head to jamb as shown.
   3. Weld clip angles to bottom of frame and top of jamb members extended to structure above for framed construction.
      a. Provide holes for anchors.
      b. Weld head to jamb members.

B. Channel Door Frames:
   1. Fabricate of structural steel channels of size shown.
   2. Miter and weld frames at corners.
   3. Where anchored to masonry or embedded in concrete, weld to back of frame at each jamb, 5 mm (3/16 inch) thick by 44 mm (1-3/4 inch) wide steel strap anchors with ends turned 50 mm (2 inches), and of sufficient length to extend at least 300 mm (12 inches) into wall. Space anchors 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb. Weld clip angles to bottom of jambs and provide holes for expansion bolts.
   4. Where anchored to concrete or masonry in prepared openings, drill holes at jambs for anchoring with expansion bolts. Weld clip angles to bottom of frame and provide holes for expansion bolt anchors as shown. Drill holes starting 600 mm (24 inches) above bottom of frame and 24 inches o.c. to top of jamb and at top of jamb. Provide pipe spacers at holes welded to channel.
   5. Where closure plates are shown, continuously weld them to the channel flanges.
   6. Weld continuous 3/4 x 3/4 x 1/8 inch thick steel angles to the interior side of each channel leg at the head and jambs to form a caulking groove.
   7. Prepare frame for installation of hardware specified in Section 08 71 00, DOOR HARDWARE.
      a. Cut a slot in the lock jamb to receive the lock bolt.
      b. Where shown use continuous solid steel bar stops at perimeter of frame, weld or secure with countersunk machine screws at not more than 18 inches on center.

C. Frames for Breech Opening:

1. Fabricate from steel channels, or combination of steel plates and angles to size and contour shown.
2. Weld strap anchors on back of frame at not over 2 feet on centers for concrete or masonry openings.

D. Frames for Lead Lined Doors:

1. Obtain accurate dimensions and templates from suppliers of lead lined doors, finish hardware, and hollow steel door frames.
2. Fabricate as shown for use in connection with lead lined doors.
3. Deliver assembled frames with removable shipping spreaders at top and bottom.
4. Extend angles at jambs from floor to structural slab above. At floors of interstitial spaces, terminate jamb sections and provide anchors as shown.
5. Continuously weld plates and reinforcements to frame members and head members of angle frames between jambs.
6. Weld strap anchors, not over 24 inches on centers, to the back of angles for embedment in masonry or concrete unless shown otherwise.
7. Type 15 Door Frames:
   a. Structural steel angle frames with plate or bar full height to heads. Extend reinforcing at hinge cutouts two inches beyond cutout.
   b. Fabricate top anchorage to beam side at mid height.
   c. Weld clip angles to both legs of angle at top and bottom.
   d. Drill clips and plates, at top and bottom for anchoring jamb angles with two 3/8 inch expansion bolts at each location.
   e. Cut rabbet for pivot hinges and lock strike.

2.11 GUARDS

A. Wall Corner Guards:

1. Fabricate from steel angles and furnish with anchors as shown.
2. Continuously weld anchor to angle.

B. Guard Angles for Overhead Doors:

1. Cut away top portion of outstanding leg of angle and extend remaining portion of angle up wall.
2. Weld filler piece across head of opening to jamb angles.
3. Make provisions for fasteners and anchorage.

C. Channel Guard at Loading Platform:
   1. Fabricate from steel channel of size shown.
   2. Weld anchors to channels as shown.
   3. Drill channel for bumper anchor bolts.

D. Edge Guard Angles for Openings in slabs.
   1. Fabricate from steel angles of sizes and with anchorage shown.
   2. Where size of angle is not shown, provide 2 x 2 x 1/4 inch steel angle with 1-1/4 x 3/16 inch strap anchors, welded to back.
   3. Miter or butt angles at corners and weld.
   4. Use one anchor near end and three feet on centers between end anchors.

E. Wheel Guards:
   1. Construct wheel guards of not less than 5/8 inch thick cast iron.
   2. Provide corner type, with flanges for bolting to walls.

2.12 GRATINGS

A. Fabricate gratings to support live loads specified and a concentrated load as specified.

B. Provide clearance at all sides to permit easy removal of grating.

C. Make cutouts in gratings with 1/4 inch minimum to one inch maximum clearance for penetrations or passage of pipes and ducts. Edge band cutouts.

D. Fabricate in sections not to exceed 25 square feet in area and 200 pounds in weight.

E. Fabricate sections of grating with end-banding bars.

F. Fabricate angle frames and supports, including anchorage as shown.
   1. Fabricate intermediate supporting members from "T's" or angles.
   2. Locate intermediate supports to support grating section edges.
   3. Fabricate frame to finish flush with top of grating.
   4. Locate anchors at ends and not over 24 inches o.c.
   5. Butt or miter, and weld angle frame at corners.

G. Steel Bar Gratings:
   1. Fabricate grating using steel bars, frames, supports and other members shown in accordance with Metal Bar Grating Manual.
   2. Galvanize steel members after fabrication in accordance with ASTM A123, G-90 for exterior gratings, gratings in concrete floors, and interior grating where specified.

3. Interior gratings: Prime paint unless specified galvanized.

H. Aluminum Bar Gratings:

1. Fabricate grating and frame assembly from aluminum as shown in accordance with Metal Bar Grating Manual.
2. Use 1 x 3/16 inch minimum size bearing bars.
3. Mill finish unless specified otherwise.

I. Plank Gratings:

1. Conform to Fed. Spec. RR-G-1602.
2. Manufacturers standard widths, lengths and side channels to meet live load requirements.
3. Galvanize exterior steel gratings ASTM A123, G-90 after fabrication.
4. Fabricate interior steel gratings from galvanized steel sheet, ASTM A525, where bearing on concrete or masonry.
5. Fabricate other interior grating from steel sheet and finish with shop prime paint. Prime painted galvanized sheet may be used.

J. Cast Iron Gratings:

1. Fabricate gratings to support a live load of 500 pounds per square foot.
2. Fabricate gratings and frames for gutter type drains from cast-iron conforming to ASTM A48.
3. Fabricate gratings in section not longer than 4 feet or over 200 pounds and fit so as to be readily removable.

2.13 PLATE DOOR SILL

A. Fabricate of checkered plate as detailed.

1. Aluminum Plate: ASTM B632, 0.125 inch thick.
2. Steel Plate: ASTM A786, 0.125 inch thick, galvanized G90.

B. Fabricate for anchorage with flat head countersunk bolts at each end and not over 12 inches, o.c.

2.14 SAFETY NOSINGS

A. Fed. Spec. RR-T-650, Type C.

1. Aluminum: Class 2, Style 2.
2. Cast iron: Class 4.

B. Fabricate nosings for exterior use from cast aluminum, and nosings for interior use from either cast aluminum or cast iron. Use one Class throughout.

C. Fabricate nosings approximately 4 inches wide with not more than 3/8 inch nose.

D. Provide nosings with integral type anchors spaced not more than 4 inches from each end and intermediate anchors spaced approximately 15 inches on center.

E. Fabricate nosings to extend within 4 inches of ends of concrete stair treads except where shown to extend full width.

F. Fabricate nosings to extend full width between stringers of metal stairs and full width of door openings.

G. On curved steps fabricate to terminate at point of curvature of steps having short radius curved ends.

2.15 RAILINGS

A. In addition to the dead load design railing assembly to support live load specified.

B. Fabrication General:

1. Provide continuous welded joints, dressed smooth and flush.
2. Standard flush fittings, designed to be welded, may be used.
3. Exposed threads will not be approved.
4. Form handrail brackets to size and design shown.
5. Exterior Post Anchors.
   a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
   b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
   c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts. Base plates are not required on pipe sleeves where ornamental railings occur.
6. Interior Post Anchors:
   a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
   b. Weld or thread flanged fitting to posts at base.
   c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
   d. Provide sliding flange base plate on posts secured with set screws.
   e. Weld flange base plate to removable posts set in sleeves.

C. Handrails:

1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Steel Pipe Railings:

1. Fabricate of steel pipe with welded joints.
2. Number and space of rails as shown.
3. Space posts for railings not over 6 feet on centers between end posts.
4. Form handrail brackets from malleable iron.
5. Fabricate removable sections with posts at end of section.
6. Removable Rails:
   a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
   b. Secure rail to brackets with 3/8 inch stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
   c. Continuously weld brackets to post.
   d. Provide slotted bolt holes in rail bracket.
   e. Weld bolt heads flush with top of rail.
   f. Weld flanged fitting to post where posts are installed in sleeves.
7. Opening Guard Rails:
   a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.
   b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.
   c. Fabricate rails for floor openings for anchorage in sleeves.
8. Gates:
   a. Fabricate from steel pipe as specified for railings.
   b. Fabricate gate fittings from either malleable iron or wrought steel.
   c. Hang each gate on suitable spring hinges of clamp on or through bolted type. Use bronze hinges for exterior gates.
   d. Provide suitable stops, so that gate will swing as shown.
   e. //Provide padlock eyes where shown. //

E. Aluminum Railings:

1. Fabricate from extruded aluminum.

2. Use tubular posts not less than 3 mm (0.125 inch) wall thickness for exterior railings.
3. Punch intermediate rails and bottom of top rails for passage of posts and machine to a close fit.
4. Where shown use extruded channel sections for top rail with 13 mm (1/2 inch) thick top cover plates and closed ends.
5. Fabricate brackets of extruded or wrought aluminum as shown.
6. Fabricate stainless pipe sleeves with closed bottom at least six inches deep having internal dimensions at least 13 mm (1/2 inch) greater than external dimensions of posts where set in concrete.

F. Stainless Steel Railings:
1. Fabricate from 1-1/2 inches outside diameter stainless steel tubing, ASTM A269, having a wall thickness of 0.065 inch.
2. Join sections by an internal connector to form hairline joints where field assembled.
3. Fabricate with continuous welded connections.
4. Fabricate brackets of stainless steel to design shown.
5. Fabricate stainless steel sleeves at least 6 inches deep having internal dimensions at least 1/2 inch greater than external dimensions of post.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect existing glazing lites for breaks and/or mullion water leaks. Bring conditions found to the attention of the VA's COR for possible repair or lite replacement.

B. Replacement of existing lites and/or repair of existing glazing is NOT included in this Contract.

C. Verify existing window frames, trim, and wall construction are adequate to receive the specified anchorage before installation. Report unsatisfactory conditions to the COR. Beginning installation constitutes acceptance of existing conditions.

3.2 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. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.

D. Field weld in accordance with AWS.

1. Design and finish as specified for shop welding.
2. Use continuous weld unless specified otherwise.

E. 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.

F. 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.

G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.

H. Secure escutcheon plate with set screw.

3.3 INSTALLATION OF SECURITY SCREEN

A. Install security screens over existing windows in the mesh position indicated:

1. Mesh Position No. 1: as indicated on the drawings.

1 2. Mesh Position No. 2: as indicated on the drawings. Provide the continuous 3/4 x 3/4 x 1/8 inch steel sill angle as backing for the wire mesh at this position.

B. Fasten securely to the existing window frame, or securely fasten to window trim and direct to the wall head and jamb structure, as indicated. Achieve the minimum fastener penetration specified in paragraph 2.3 and space fasteners at 8 inches (200 mm) on center maximum.

C. Install mesh taut, flat, and square, with edges fully captured or fastened at the perimeter. Cut edges clean; no sharp or protruding edges shall remain exposed.

E. Seal the perimeter of the screen frame to adjacent construction where required to prevent water intrusion, using sealant specified in Section 07 92 00, JOINT SEALANTS.

3.4 INSTALLATION OF SUPPORTS

A. Anchorage to structure.

1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.

2. Secure supports to concrete inserts by bolting or continuous welding as shown.
3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
4. Secure steel plate or hat channels to studs as detailed.

B. Ceiling Hung Toilet Stalls:
1. Securely anchor hangers of continuous steel channel above pilasters to structure above.
2. Bolt continuous steel angle at wall to masonry or weld to face of each metal stud.
3. Secure brace for steel channels over toilet stall pilasters to wall angle supports with bolts at each end spaced as shown.
4. Install diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.
5. Install stud bolts in lower flange of channel before installing furred down ceiling over toilet stalls.
6. Install support for ceiling hung pilasters at entrance screen to toilet room similar to toilet stall pilasters.

C. Supports for Wall Mounted items:
1. Locate center of support at anchorage point of supported item.
2. Locate support at top and bottom of wall hung cabinets.
3. Locate support at top of floor cabinets and shelving installed against walls.
4. Locate supports where required for items shown.

D. Support at Ceiling for X-ray Tube Stand and Radiographic Equipment:
1. Bolt modular steel channel frames to hangers as shown, anchored to structure above.
2. Fasten frames with modular channel manufacturers fittings, bolts, and nuts. Space modular channel supports and hangers as shown and as required to suit equipment furnished.
3. Install closure plates in channels at ceiling where channel opening is visible. Coordinate and cut plates to fit tight against equipment anchors after equipment anchors are installed.

E. Ceiling Support for Operating Light:
1. Anchor support to structure above as shown.
2. Set leveling plate as shown level with ceiling.
3. Secure operating light to leveling plate in accordance with light manufacturer's requirements.

F. Supports for intravenous (IV) Track and Cubicle Curtain Track:

1. Install assembly where shown after ceiling suspension grid is installed.
2. Drill angle for bolt and weld nut to angle prior to installation of tile.

G. Support for cantilever grab bars:

1. Locate channels or tube in partition for support as shown, and extend full height from floor to underside of structural slab above.
2. Anchor at top and bottom with angle clips bolted to channels or tube with two, 3/8 inch diameter bolts.
3. Anchor to floors and overhead construction with two 3/8 inch diameter bolts.
4. Fasten clips to concrete with expansion bolts, and to steel with machine bolts or welds.

H. Supports for Trapeze Bars:

1. Secure plates to overhead construction with fasteners as shown.
2. Secure angle brace assembly to overhead construction with fasteners as shown and bolt plate to braces.
3. Fit modular channel unit flush with finish ceiling, and secure to plate with modular channel unit manufacturer's standard fittings through steel shims or spreaders as shown.
   a. Install closure plates in channel between eye bolts.
   b. Install eyebolts in channel.

I. Support for Communion Rail Posts:

1. Anchor steel plate supports for posts as shown.
2. Use four bolts per plate, locate two at top and two at bottom.
3. Use lag bolts.

3.5 COVERS AND FRAMES FOR PITS AND TRENCHES

A. Set frame and cover flush with finish floor.

B. Secure plates to frame with flat head countersunk screws.

C. Set gratings loose in drainage trenches or over pits unless shown anchored.

3.6 FRAMES FOR LEAD LINED DOORS

A. Secure jamb angle clips and plates, at top and bottom with two, 3/8 inch expansion bolts to concrete.

B. Secure 6 x 3-1/2 x 1/2 inch angle to steel framing for anchorage when expansion bolts to concrete is not possible.

C. Secure clips by welding to steel.

D. At interstitial spaces, anchor jamb angles as shown.

3.7 DOOR FRAMES

A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.

B. Level and plumb frame; brace in position required.

C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.

D. Set frames in formwork for frames cast into concrete.

E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

3.8 OTHER FRAMES

A. Set frame flush with surface unless shown otherwise.

B. Anchor frames at ends and not over 18 inches on centers unless shown otherwise.

C. Set in formwork before concrete is placed.

3.9 GUARDS

A. Steel Angle Corner Guards:

1. Build into masonry as the work progress.
2. Set into formwork before concrete is placed.
3. Set angles flush with edge of opening and finish floor or wall or as shown.
4. At existing construction fasten angle and filler piece to adjoining construction with 5/8 inch diameter by 3 inch long expansion bolts 18 inches on center.
5. Install Guard Angles at Edges of // Trench // Stairwell // Openings in Slab // Dock Leveler // Overhead Doors where shown.

B. Channel Guard at Top Edge of Concrete Platforms:

1. Install in formwork before concrete is placed.
2. Set channel flush with top of the platform.

C. Wheel Guards:

1. Set flanges of wheel guard at least 2 inches into pavement.
2. Anchor to walls as shown, expansion bolt if not shown.

3.10 GRATINGS

A. Set grating flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.

B. Set frame in formwork before concrete is placed.

C. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.

D. Secure removable supporting members in place with stainless steel bolts.

E. Bolt gratings to supports.

3.11 STEEL LINTELS

A. Use lintel sizes and combinations shown or specified.

B. Install lintels with longest leg upstanding, except for openings in 6 inch masonry walls install lintels with longest leg horizontal.

C. Install lintels to have not less than 6 inch bearing at each end for nonbearing walls, and 8 inch bearing at each end for bearing walls.

3.12 SHELF ANGLES

A. Anchor shelf angles with 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.

3.13 PLATE DOOR SILL

A. Install after roofing base flashing and counter flashing work is completed.

B. Set in sealant and bolt to curb.

3.14 SAFETY NOSINGS

A. Except as specified and where preformed rubber treads are shown or specified install safety nosings at the following:

1. Exterior concrete steps.
2. Door sills of areaway entrances curbs.
3. Exposed edges of curbs of door sills at transformer and service rooms.
4. Interior concrete steps, including concrete filled treads of metal stairs of service stairs.

B. Install flush with horizontal and vertical surfaces.

C. Install nosing to within 4 inches of ends of concrete stair treads, except where shown to extend full width.

D. Extend nosings full width of door openings.

E. Extend nosings, full width between stringers of metal stairs, and terminate at point of curvature of steps having short radius curved ends.

3.15 LADDERS

A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.

B. In elevator pits, set ladders to clear all elevator equipment where shown on the drawings.

1. Where ladders are interrupted by division beams, anchor ladders to beams by welding, and to floors with expansion bolts.
2. Where ladders are adjacent to division beams, anchor ladders to beams with bent steel plates, and to floor with expansion bolts.

C. Ladder Rungs:

1. Set ladder rungs into formwork before concrete is placed. // Build ladder rungs into masonry as the work progresses. //
2. Set step portion of rung 150 mm (6 inches) from wall.
3. Space rungs approximately 300 mm (12 inches) on centers.
4. Where only one rung is required, locate it 400 mm (16 inches) above the floor.

3.16 RAILINGS

A. Steel Posts:

1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
2. Install sleeves in concrete formwork.
3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS-on exterior posts.
4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
5. Secure sliding flanged fittings to posts at base with set screws.
6. Secure fixed flanged fittings to concrete with expansion bolts.
7. Secure posts to steel with welds.

B. Aluminum Railing, Stainless Steel Railing, and Ornamental Railing Posts:

1. Install pipe sleeves in concrete formwork.
2. Set posts in sleeve and pour grout to surface on exterior locations and to within 1/4 inch of surface for interior locations except to where posts are required to be removable.
3. Apply beveled bead of urethane sealant over sleeve at post perimeter for exterior posts and flush with surface for interior posts as specified in Section 07 92 00, JOINT SEALANTS.

C. Anchor to Walls:

1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
    a. Anchor steel plate to concrete or solid masonry with expansion bolts.
    b. Anchor steel plate to hollow masonry with toggle bolts.
2. Anchor flanged fitting with toggle bolt to steel support in frame walls.

D. Removable Rails:
1. Rest rails in brackets at each end and secure to bracket with stainless steel bolts and nuts where part of a continuous railing.
2. Rest rail posts in sleeves where not part of a continuous railing. Do not grout posts.

E. Gates:
1. Hang gate to swing as shown.
2. Bolt gate hinges to jamb post with clamp on or through bolts.

F. Chains:
1. Eye bolt chains to pipe posts.
2. Eye bolt anchoring at walls.
    a. Expansion bolt to concrete or solid masonry.
    b. Toggle bolt to hollow masonry of frame wall installed support.

G. Handrails:
1. Anchor brackets for metal handrails as detailed.
2. Install brackets within 12 inches of return of walls, and at evenly spaced intermediate points not exceeding 4 feet on centers unless shown otherwise.
3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to installed supporting frame wall and to hollow masonry unless shown otherwise.

3.17 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.

- - - END - - -