SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SCOPE:

A. Provide all of the labor, materials, equipment and services required to furnish and install the miscellaneous metal items.

B. All items of miscellaneous metal work and related parts are not necessarily described. The most important and those requiring detailed description are usually mentioned. Provide all other work as indicated on the Drawings and/or necessary to complete the Contract, except for items which may be specifically excluded from the work of this Section.

C. Work includes, but is not limited to:
1. Miscellaneous steel framing, supporting angles, plates, brackets, clips, anchors and bolts for equipment and other work not specifically mentioned elsewhere.
2. Supportive framing for equipment or other items.
3. Hardware and fasteners for attachments.
4. Embedding edge angles in concrete.
5. Bollards.
6. Steel supports for coiling grilles and shutters.
7. Elevator hoist way door sill angles, sump grates, and frames.

1.02 QUALITY ASSURANCE:

A. In addition to complying with all pertinent codes and regulations, comply with:
1. "Specification for Design, Fabrication, and Erection of Structural Steel for Building" of the American Institute of Steel Construction.
2. "Code for Welding in Building Construction" of the American Welding Society.
3. Manual of Steel Construction, 9th edition, Part 1 for types of steel required.

B. Conflicting requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards of these Specifications, the provisions of the more stringent shall govern.

C. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.03 SUBMITTALS:

A. Prior to installation, submit to the Architect for review the following:
1. Shop drawings showing all locations, markings, quantities, materials, sizes, and shapes and indicate all methods of connecting, anchoring, fastening, bracing, and attaching to the work of other Trades.
2. Prequalified welding procedures, prepared by the steel fabricator and erector, as a written procedure specification to the Architect. Prepare these procedures in accordance with Appendix E of the AWS Structural Welding Code.
3. Written erection sequence and procedure to be used by steel erector.
4. Mill certification that steel supplied meets requirements of specifications.
5. Electrode manufacturer's certification that the electrode and flux combination meets the requirements of the particular classification or grade of electrodes.
6. Certification that each welder has satisfactorily passed AWS qualification tests for

welding processes involved and, if pertinent, has undergone recertification.

7. Certification that surface preparation has been completed in accordance with the instructions and recommendations of the paint or coating manufacturer.
8. Shop primer: Complete manufacturer's literature fully describing the product, mill thickness and application.

1.04 PRODUCT HANDLING:

A. Stack and store steel above ground on platforms, studs, or other supports. Protect steel from corrosion and damage. Keep materials clean.

B. Store other materials in a weathertight, dry place until ready for use.

C. Store packaged materials in their original, unbroken package or container.

1.05 PROJECT CONDITIONS:

A. Field measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 MISCELLANEOUS STEEL SHAPES:

A. ASTM A 36, ASTM A992 and ASTM A500(B).

B. For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.02 WELDING ELECTRODES:

A. Electrodes having low hydrogen covering shall be purchased in hermetically sealed containers.

B. For fabricating plant use: E-70 electrodes, AWS A5.5, A5.17, and A5.20.

C. For field use: E-70 electrodes, AWS A5.5, A5.17, and A5.20.

2.03 FASTENERS:

A. Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro-deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568, Property Class 4.6), with hex nuts, ASTM A563 (ASTM A563M), and, where indicated, flat washers.

C. Machine screws: ANSI B18.6.3.

D. Lag screws: ANSI BH18.2.1 (ANSI B18.2.3.8M).

E. Wood screws: Flat head, carbon steel, ANSI B18.6.1.

F. Plain washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M0).

G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

H. Expansion anchors: Anchor bolt 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 E488 conducted by a qualified independent testing agency.
   1. Carbon steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
   2. Group 1 alloy 304 or 316 stainless-steel bolts and nuts comply with ASTM F593 (ASTM F738M) and ASTM F594 (ASTM F836M).

I. Toggle bolts: FS FF-B-588, tumble-wing type, class and style as required.

J. Concrete anchors: Simpson Set Epoxy Anchors with A307 rods.

2.04 GROUT:

A. Nonshrink, metallic grout: Factory-packaged, ferrous-aggregate grout comply with ASTM C1107, specifically recommended by manufacturer for heavy-duty loading applications.

B. Nonshrink, nonmetallic grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior application.

2.05 FABRICATION:

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles an surfaces and straight sharp edge.

C. Exterior work: Allow for thermal movement resulting from change in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Shop assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE:

A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.07 MISCELLANEOUS FRAMING AND SUPPORTS:

A. Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

2.08 MISCELLANEOUS STEEL TRIM:

A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.

B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work.

2.09 SHOP COAT:

A. Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Exteriors: SSPC-SP 6 "Commercial Blast Cleaning".
   2. Interiors: SSPC-SP 3 "Power Tool Cleaning".

B. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting. Use only top quality, rust-inhibiting primer.
   1. Ensure that primer is compatible with finish, field paint. See Section 09 91 00, Paint.

2.10 GALVANIZING:

A. Any metal that has any surface or edge exposed to the weather shall be hot-dip galvanized after fabrication. All galvanized shall meet the requirements set forth in ASTM A 446-76 and ASTM A 525-80.

2.11 MANUFACTURED ITEMS:

A. Manufactured items of types normally carried in stock inventories, as distinguished from items fabricated especially for this Project, shall be fabricated from materials customarily used by the manufacturer, irrespective of the requirements of this Specification, unless in particular instances, special materials shall be specified. With respect to shop prime coats of paint on such stocked items, manufacturer's standard finish will be accepted unless specified otherwise.

2.12 PIPE BOLLARDS:

A. Fabricate from Schedule 80 steel pipe.
   1. Hot-dip galvanized. Meet the requirements set forth in ASTM A 446-76 and ASTM A 525-80.

B. Heights: 48" above finished grade, 7'-0" Total height.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Coordinate and furnish anchorage, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.02 INSTALLATION, GENERAL:

A. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, wood screws, and other connectors as necessitated.

B. Cutting, fitting, and placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in from work for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after

fabrication and are intended for bolted or screwed field connections.

E. Field welding:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

F. Corrosion protection: Protect concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a minimum layer of 3/8" neoprene sheet, washer, or plywood. Bituminous paint may be allowed in certain areas as approved by the Architect.

3.03 CONTINUOUS BENT PLATES:

A. Provide continuous single angles in long lengths where indicated or necessitated. Drill ½" holes for wood attachment at 24" o.c. where required.

3.02 MISCELLANEOUS CLIP ANGLES AND BENT PLATES:

A. Provide as indicated or necessitated. Drill ½" holes for wood attachment at 24" o.c. where required.

3.03 ANGLES AT ROOF DECK OPENINGS:

A. Provide angles in single lengths where indicated. Drill ½" holes for attachment of wood, with a minimum of two attachment points and a maximum spacing of 24" o.c.

3.04 LOOSE LINTELS:

A. Make loose lintels long enough to provide 8" of bearing on each end.
1. Hot-dip galvanized.
2. Provide loose lintels to the masonry trade for installation.

3.05 WELDING PLATES:

A. Fabricate plates of sizes indicated. Fabricate to have a minimum of two Nelson Studs on bottom side of plates. Use stud sizes indicated.

3.06 SHOP COAT:

A. Before steel leaves shop, remove loose mill scale, rust and foreign matter, and apply one coat of primer. Do not paint surfaces at places to be welded.

3.07 ERECTION:

A. Use only experienced welders qualified by American Welding Society prescribed testing.

p Miscellaneous angles, bent plates, and clip angles: Install as indicated.

B. Bent plates at roof edges: Before welding plates to structural members, accurately align them so that wood members shall be installed on bent plates can be plumbed with face of brick. After

bent plates are lined up, weld them securely in place.

C. Welding plates: Install welding plates when concrete and bond beams are set. When concrete has begun to set, clean off tops of plates to assure clean welding surfaces.

D. Steel plates: Install plates as indicated.

E. Threaded anchor bolts: Have anchor bolts formed into slab as indicated.

3.08 PIPE BOLLARDS:

A. See Drawings for installation.

B. Install footing prior to application of pavement materials.

C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solidly with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

D. Fill bollards solidly with concrete, mounding top surface.

3.09 CLEAN-UP:

A. When steel has been installed, clean up spatter and debris resulting from welding. Where welding is rough and may interfere with smooth laying of metal deck, grind welds.

3.10 TOUCH-UP PAINTING:

A. When steel has been installed, touch-up welds, scarred and abraded places on bent plates, structural steel and bar joists with rust-inhibiting paint. Ensure compatibility with finish, field paint. See Section 09 91 00.

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