Section 051200
Structural and Miscellaneous Steel
(General)

PART 1 - GENERAL

1.01 Conditions

A. The general provisions of the Contract, including General and Special Provisions apply to the work specified in this Section.

1.02 Scope of Work

A. Furnish all labor, materials, and equipment as required to fabricate and install all structural and miscellaneous steel work as indicated on Drawings and specified herein.

B. Although such work or materials are not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a secure and complete installation.

C. Provide shop drawings for all work.

D. Completely coordinate with work of all other trades.

1.03 References (Latest Edition)

A. AISC: Standard Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings by the American Institute of Steel Construction (AISC).

B. AISC – Code of Standard Practice – Manual of Steel Construction – Allowable Stress Design (ASD).

C. AISC – Code of Standard Practice of Steel Buildings and Bridges.

D. ASTM A36 – Structural Steel

E. ASTM A-53: Black and Hot Dipped Zinc – Coated Welded and Seamless Steel Pipe.

F. ASTM A-120: Black and Hot Dipped Zinc – Coated Welded and Seamless Steel Pipe.

G. ASTM A307 – Carbon Steel Externally Threaded Standard Fasteners.

H. ASTM A500 – Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

I. ASTM A501 – Hot Formed Welded and Seamless Carbon Steel Structural Tubing.

J. AWS A2.4 – Symbols of Welding, Brazing, and Nondestructive Examination.

K. AWS D1.1 – Structural Welding Code.

L. SSPC (Steel Structures Painting Council) – Painting Manual.

M. Uniform Building Code (UBC), latest edition.

1.04 Regulatory Requirements

A. Safety Requirements: Work shall comply with all Federal, State and municipal regulations regarding safety, including the requirements of the following:

1. William-Steiger Occupational Safety & Health Act of 1970

2. State of California, California Administrative Code, Title 8 Industrial Relations, Chapter 4, Subchapter 4, “Construction Safety Orders” and other State and local agencies having jurisdiction.

B. Uniform Building Code (UBC), latest edition.

1.05 Submittals

A. Shop Drawings: General

1. Before any structural steel is fabricated or delivered to jobsite, submit Shop Drawings in accordance with the General Conditions of these specifications.

2. Shop Drawings shall clearly show all pieces with all pertinent dimensions, data, layout, sizes and weights, connections, and all controlled dimensions and elevations. Drawings shall clearly distinguish between shop and field bolts and welds. Errors in dimensions shown on shop drawings shall be responsibility of Contractor.

3. Show details, including cuts, copes, connections, holes, threaded fasteners, and welds in accordance with AWS.

4. Indicate which structural units, members or brackets require field cuts or welds due to construction techniques.

5. Indicated metal fabricator's method for radius form bents of pipe or tubing.

6. All shop and field welds shall be indicated by AWS Welding Symbols.

   a) Indicate size, length and type of each weld.

   b) Special Inspection required by UBC and Building Department.

B. Welding:

1. Certification of Welder's Qualifications.

2. Welding Procedure: Submit descriptive data to illustrate welding procedures to be performed.

1.06 Quality Assurance

A. Fabricated structural steel members in accordance with AISC Code of Standard Practice.

B. Perform Work in accordance with AISC Section 10.

C. Perform Work in accordance Uniform Building Code (UBC), latest edition.

D. All welding procedures, welders, welding operation, and tackers shall be qualified in accordance with AWS Standard Code D1.1.

E. Maintain one copy of each document on site.

F. Fabricator: Company specializing in performing the work of this section.

G. Erector: Company specializing in performing the work of this section.

H. All construction shall conform with applicable building codes, project specifications and applicable regulations. Where the provisions of applicable codes, material manufacturer's requirements, and project specifications conflict, the more stringent provision shall govern.

I. Certification: Furnish, before fabrication, a mill certified report (in duplicate) of the tests for ach heat of steel or iron from which the material is to be fabricated, containing the results of chemical and physical tests required by the ASTM specifications for the materials.

J. Qualify welding processes and welding operators in accordance with AWS "Standard Qualifications Procedure". Provide certification that welders to be employed in work have satisfactorily passed AWS qualification test within the previous twelve (12) months. If recertification of welders is required, retesting will be Contractor's responsibility.

K. Work shall comply with the Drawings, Specifications and approved Shop Drawings in every aspect. All errors of fabrication and connections, defective materials, fasteners, and workmanship shall be replaced at the expense of the Contractor.

1.07 Delivery, Storage and Handling

A. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete or masonry in ample time so as not to delay that Work.

B. Store materials to permit easy access for inspection and identifications. Keep steel members off the ground using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. Remove any damaged items from the site and replace at no cost to the Owner.

C. Use all means necessary to protect structural steel before, during and after installation.

1.08 Coordination

A. Coordinate and furnish all required anchorages, templates, and patterns, setting drawings, and installation directions for all built-in items. Supervise the proper location and the installation of all built-in items. Deliver all items required to be embedded in concrete, masonry or built into other material to their respective Contractor. Provide holes and connections for Work of others Contractors.

1.09 Field Measurements

A. Take field measurements prior to preparation of Shop Drawings and metal fabrication. Proper fit and attachments of all items is required; allow for trimming and fitting when taking field measurements before metal fabrication.

1.10 Shop Assembly

A. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 2 - PRODUCTS

2.01 General

A. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended.

B. Metal surfaces used for fabrications of miscellaneous metal items which will be exposed to view shall be smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

C. All other materials not specifically described, but required for a complete and proper installation, shall be new, free from rust, best quality of their respective kind, and subject to the approval of the Project Inspector.

2.02 Steel Plates, Shapes and Bars

A. All miscellaneous steel shall be standard cold-rolled sections, new, free from rust, and conforming to ASTM A-36.

2.03 Steel Pipe

A. All steel pipe shall be black steel pipe, except where indicated to be galvanized, complying with provisions of:

1. ASTM A-120, Schedule 40 for pipe less than four (4) inch diameter.

2. ASTM A-53 ERW for pipe greater than four (4) inch diameter.

2.04 Steel Tubing

A. All steel tubing shall be cold-formed steel tubing conforming to ASTM A-500, Grade B.

2.05 Fasteners

A. General: Provide electro-zinc plated fasteners for exterior use or where built into exterior walls or slabs. Select fasteners for the type, grade and class specified.

B. Bolts and Nuts: Regular hexagon-head carbon steel type conforming to ASTM A-307, Grade A with electro-zinc plating.

C. Flat Washers: U.S.S. standard round carbon steel type conforming to FS FF-W-92 with electro-zinc plating.

D. Lock Washers: Helical spring carbon steel type conforming to FS FF-W-84 with electro-zinc plating.

E. Anchor Bolts: Nonheaded “J” bolt type, unless otherwise indicated on Drawings, conforming to ASTM A-307, Grade A with electro-zinc plating.

2.06 Shop Paint

A. Primer shall be Red Oxide Primer, conforming to Federal Specification TT-P-31 for steel surfaces and Federal Specifications TT-P-64b for galvanized surfaces.

2.07 Grout

A. Pre-mixed, factory packaged, non-shrinking, non-metallic, non-staining, non-corrosive and non-gaseous group complying with CE CRD-C588. Provide grout specifically manufactured for exterior applications.

PART 3 - EXECUTION

3.01 General

A. Comply with AISC Code and Specifications and maintain Work in safe and stable conditions during erection. Provide temporary bracing and shoring as required; remove when final connections are in-place.

B. Execute all Work using skilled metal workers only. Do all welding as per AWS Specifications with certified welders.

C. When possible, fit and shop assemble all metal Work, ready for installation, with shop and field connections welded or attached with fasteners as indicated on Drawings.

D. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where fabrication and installation of the work of this section may properly commence.

E. Make all required measurements in the field to ensure proper and adequate fit of miscellaneous metal items.

F. It is the intent of the Drawings to indicate detail connections. Where connection detail is not shown, detail shall be patterned after a connection similar condition, or an AISC standard type.

3.02 Fabrication

A. General

1. Use materials of size and thickness indicated on Drawings or approved on Shop Drawings to produce strength and durability in finished product for use intended. Work to dimensions are indicated on drawings or approved on Shop Drawings, using proven details of fabrication and support.

2. All fabrication shall be in accordance with AISC Specifications for fabrication of structural steel, Uniform Building Codes, and requirements of regulatory agencies.

3. Do not field cut or alter structural metal units, members or brackets without approved Shop Drawings.

4. Fabricate and pre-assemble work in shop to greatest extent possible.

5. Fabricate exposed work true to line, shape and level with accurate angles and radiuses. Ease exposed metal edges to a radius of approximately 1/32 inch.

6. Make cuts, bends, punching and drilling accurate, neat and properly located. Grind and file smooth all parts exposed to view; leave exposed surfaces free of fabrication marks. Mark and match-mark units requiring field assembly.

7. All welds shall be continuous, unless otherwise indicated, complying with AWS Specifications. Form exposed connections with tight, flush and smooth hairline joints. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

8. Cut, reinforce, drill and tap fabricated metal work as indicated on Drawings to receive finish hardware, fasteners and similar items.

B. Bolted Connections:

1. Punch or drill holes 1/16 inch larger than bolt size and spear-ream before inserting bolts.

2. Ream unfair holes, but only up to next larger bolt size. Where unfairness exceeds maximum, weld hole in base material solid and drill hole of proper size.

3. As erection progresses, bolt up work to take care of dead load, lateral forces, and erection stresses. Provide any additional bracing necessary to resist all possible forces during erection. Contractor is entirely responsible for the stability of the structural steel work until the job is complete.

C. Assembly with Standard Threaded Fasteners:

1. Beveled Washers: Provide under bolt heads or nuts resting on surfaces exceeding 5 percent slope with respect to head or nut.

2. Draw up tight, check threads with chisel, or provide approved lock washers or self-tightening nuts.

D. Welded Connections:

1. Perform welding using shielded metal arc, submerged arc, gas metal arc, or flux cored arc methods in accordance with appropriate sections of AWS D1.1 and UBC Chapter 27.

2. In addition to specific requirements of Drawings, details of welded joints shall comply with all requirements for joints which are accepted without qualification tests under the AWS Code. If sizes of fillet welds are not shown on Drawings, use AWS minimum weld size, but not less than thinnest part thickness minus 1/16 inch.

3. Plan welding operations to eliminate stress build-up.

4. Field Welding:

a) Perform field welding in accordance AWS D1.1.

b) Where field welding is applied to existing flexural members involving application of significant amounts of heat to member, provide temporary shoring to prevent deflections.

c) Provide Special Inspection per the UBC, latest edition.

E. Column Bases:

1. Finish in accordance with AISC. Lack of contact bearing with column shall not exceed 1/16 inch.

F. Bearing Plates:

1. Finish in accordance with AISC. Provide for attachment as shown on Drawings.

G. Cut, drill (tap where indicated or required), or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

3.03 Shop Painting

A. Shop paint all metal Work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, stainless steel, and galvanized surfaces, unless otherwise indicated.

B. Clean all metal work to be primed and painted in accordance with SECTION 099100 – PAINTING AND FINISHES.

C. Immediately after surface preparation brush or spray on primer in accordance with manufacturer's instruction at a rate to provide uniform dry film thickness of 20 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.

D. Apply one (1) shop coat to fabricated metal items, except apply two () coats of primer to surfaces inaccessible after assembly or installation.

E. Give any painted built-in portions one (1) field coat of primer on all abraded areas after installation.

3.04 Galvanizing

A. All metal fabrications intended for exteriors use or for use in high moisture areas are to be hot-dip galvanized, unless otherwise noted.

B. Hot dip galvanizing or zinc coatings, applied on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips shall comply with ASTM Specification A123-73.

C. Hot dip galvanizing or zinc coatings on assembled steel products shall comply with ASTM Specifications A386.

D. The weight of coatings shall be as designated in Table 1 for the class and thickness of material to be coated. Galvanized surfaces for which a shop coat of paint is specified shall be chemically treated to provide a bond for the paint.

E. Except for bolts and nuts, all galvanizing shall be done after fabrication.

3.05 Installation

A. General:

1. Compliance: Erect and install all miscellaneous metal in strict accordance with the Drawings, the reviewed shop drawings, and the referenced standards, aligning straight, plumb, and level within a tolerance of one in 200. Accurately assemble structural steel to lines and elevations indicated, within specified AISC tolerances.

2. Splice metal Work only where indicated and approved on Shop Drawings.

3. Install anchorage devices and fasteners where required for securing miscellaneous metal fabrications to in-place construction; including anchorage devices and fasteners that require to be cast into concrete or masonry. Provide temporary bracing or anchors in formwork for items cast into concrete or similar construction.

4. Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set Work accurately in location, alignment and elevation. Install items plumb, level, true and free of rack; measured from established lines and levels.

5. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded due to shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.

6. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

7. All field welds shall conform to AWS Specifications. Grind all exposed welds smooth and flush to match and blend with adjoining surfaces.

8. Clean and touch-up all field welds and scratches with shop paint as specified.

3.06 Finishes

A. Finish all fabricated metal Work as per SECTION 099100 – PAINTING AND FINISHES.

END OF SECTION