

## **SECTION 05120 - STRUCTURAL STEEL**

### **PART 1 - GENERAL**

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section.

### **PART 2 - RELATED WORK SPECIFIED ELSEWHERE**

- A. Grouting under base and bearing plates, Division 3.

### **PART 3 - FURNISHED BUT INSTALLED ELSEWHERE**

- A. Anchor bolts, loose bearing plates which will be installed under Division 3.

### **PART 4 - REQUIREMENTS FOR REGULATORY AGENCIES**

- A. AISC Specification Structural Steel for Buildings shall mean AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, current edition.
- B. Specification for Structural Joints shall mean "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts, approved by the Research Council on Riveted and Bolted Joints of the Engineering Foundation, current edition.
- C. AWS Building Code shall mean AWS "Code for Welding in Building Construction", DI .0-69.

### **PART 5 - QUALIFICATIONS**

- A. Welding procedures, welders, welding operations and tackers shall be qualified in accordance with AWS Building Code.

### **PART 6 - SUBMITTALS**

- A. Shop Drawings:
  - 1. Submit shop drawings indicating all shop and erection details, including cuts, copes, connection, holes, threaded fasteners and welds.
  - 2. All welds, both shop and field shall be indicated by AWS "Welding Symbols" A2.0-68.
- B. Erection Procedure: Submit descriptive data to illustrate the structural steel erection procedure, including the sequence of erection and temporary staying and bracing.
- C. Welding Procedure: Submit written description as required to illustrate each welding procedure to be performed in the specified work.
- D. Field Welding Equipment: Submit descriptive data for field welding equipment, including

type, voltage and amperage.

E. Reports of mechanical tests for high strength threaded fasteners.

## **PART 7 - PRODUCT HANDLING**

A. Delivery of materials to be installed under other sections:

1. Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work.
2. Provide setting drawings, templates, and directions for the installation of the anchor bolts and other devices.

B. Storage of Materials:

1. Structural steel members which are stored at the project site shall be above ground on platforms, skids or other supports.
2. Steel shall be protected from corrosion.
3. Other materials shall be stored in a weathertight and dry place, until ready for use in the work.
4. Packaged materials shall be stored in their original unbroken package or container.

## **PART 8 - MATERIALS**

A. Steel Shapes, Bars and Plates:

1. ASTM A 36-69.

B. Structural steel, fabrication and erection shall comply with the American Institute of Steel Construction, Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.

C. Anchor Bolts: Conform to Section 1C of ASTM A 307-68

D. High-Strength Threaded Fasteners: ASTM A 325-74.

E. Filler Metals for Welding:

1. Shielded metal-arc welding: AWS A5.1-69 or A5.5-69.
2. Submerged arc welding: AWS A5.17-69.

F. Shop Paint Primer:

1. Standard Primer: SSPC Paint 14-64T.
- G. All bolted connections shall be of high strength bolts conforming to ASTM A 325 and shall be bearing type with threads excluded from shear plane.
- H. All structural steel shall be accurately set and properly secured in place. Field connections of steel work shall be welded or bolted with high strength bolts, size as called for on the drawings. Connections shall be as detailed. All welding to be done by certified welders with at least five years experience in structural welding, and in a neat workmanlike manner.

## **PART 9 - FABRICATION**

- A. Fabricate Structural Steel in accordance with the AISC Specification with the modifications and additional requirements specified in this section:
  1. Shop and field welding shall conform to AWS and AISC Standards and Specifications.
- B. Shop connections shall be welded.
- C. Field Connections:
  1. Provide bolted, except where welded connections are indicated.
  2. High strength threaded fasteners shall be used for bolted connections, except where standard threaded fasteners are permitted.
- D. High-Strength Bolted Construction Assembly:
  1. Tightening shall be done in accordance with Section 5 of Specifications for Structural Joints.
- E. Welded Construction:
  1. Welding process shall be limited to one or a combination of the following:
    - a. Manual shielded-arc.
    - b. Submerged arc.
- F. Column Bases shall be milled and attached to columns.
- G. Shop Painting:
  1. Shop paint all steelwork.
  2. Steelwork to be painted shall receive a one-coat shop paint system in accordance with

## **PART 10 - ERECTION**

- A. Erect structural steel in accordance with the AISC Specifications with modifications and additional requirements of this section:
- B. Column Bases and Bearing Plates:
  - 1. Attached column bases and bearing plates for beams and similar structural members shall be aligned with wedges or shims.
  - 2. Loose column bases and bearing plates which are too heavy to be placed without a derrick or crane shall be set and wedged or shimmed.
- C. Erection Tolerances:
  - 1. Individual pieces shall be erected so that the deviation from plumb, level and alignment shall not exceed 1 to 500.
- D. Field Assembly:
  - 1. The various members forming parts of a complete frame or structure after being assembled shall be aligned and adjusted accurately before being fastened.
  - 2. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact.
  - 3. Bearing surfaces and surfaces which will be in permanent contact shall be cleaned before the members are assembled.
  - 4. Splices shall be permitted only where indicated.
  - 5. Field connections, field welds, and shear connectors shall be as specified in "Fabrication."
  - 6. Erection bolts used in welded construction shall be tightened and left in place.
- E. Gas Cutting: Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect.

## **PART 11 - TOUCH-UP PAINTING**

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint, and paint all exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

End of Section

## SECTION 05400 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.01 Summary

A. Section Includes:

1. Exterior and interior nonload-bearing stud framed walls and curtainwalls.

B. Products Supplied But Not Installed Under This Section:

1. Anchor Bolts.

C. Related Sections:

1. 05120 - Structural building frame
2. 04200 - Masonry veneer
3. 07210 - Building Insulation
4. 09110 - Non-Load-Bearing Wall Framing
5. 09250 - Gypsum Board

#### 1.02 System Requirements

A. Performance Requirements:

1. Size components to withstand design loads as shown on Drawings, and following deflection limits:
  - a. Exterior Non-Load-Bearing Curtainwall: horizontal deflection of 1/600 of wall height.

#### 1.03 Submittals

A. Reference Section 01300 - Submittal Procedures; submit following items:

1. Product Data.
2. Shop Drawings: Show wall sections coordinated with Drawings showing framing, accessories, anchorage, and connection details.
3. Quality Assurance/Control Submittals:
  - a. Qualifications: Proof of manufacturer, installer, and welder qualifications.
  - b. Structural Design Calculations.
  - c. Certificates:
    - 1) Mill certificates signed by framing member/accessory manufacturer certifying compliance with material requirements.
    - 2) Welder

- d. Manufacturer's Installation Instructions for framing members and framing accessories.
- B. Closeout Submittals: Reference Section 01700 - Closeout Submittals; submit following items:
  - 1. Record Drawings.

#### 1.04 Quality Assurance

##### A. Overall Standards:

- 1. Calculate structural properties of cold-formed metal framing and accessories in accordance with AISI "Specification for the Design of Cold-Formed Steel Structural Members."
- 2. Provide structural design calculations sealed and signed by a Professional Engineer licensed in the state where the Project is located.
- 3. Welding Standards: Comply with AWS D1.1 "Structural Welding Code-Steel," and AWS D1.3 "Structural Welding Code-Sheet Steel."

##### B. Qualifications:

- 1. Manufacturers' Qualifications: Minimum five years experience in producing products of the type specified.
- 2. Installer Qualifications: Minimum three years experience in installation of the type of products specified.
- 3. Welder Qualifications: Current AWS Certificates for welding processes required.

#### 1.05 Delivery, Storage, and Handling

- A. Reference Section 01620 - Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions.

## **PART 2 - PRODUCTS**

#### 2.01 Manufacturers

- A. Studs, Tracks, Joists, Trusses: Any manufacturer complying with requirements specified herein.

## 2.02 Framing Members

- A. Studs: ASTM A 653/653 M steel, galvanized, channel shaped with lipped flanges, punched web, size as shown on Drawings.
- B. Tracks: ASTM A 653/653 M steel, same designation, coating, and thickness as studs except as otherwise noted, channel shaped, solid web, depth compatible with studs, size, thickness and grade as required by structural design calculations.

## 2.03 Framing Accessories

- A. Material: ASTM A 653 steel; SS Grade 50 (340), Class 1, 50 ksi (340 MPa) minimum yield strength, 65 ksi (450 MPa) minimum tensile strength, G60 (Z180) hot-dipped galvanized coating, except as otherwise noted.
- B. Stamp manufacturer's name on each accessory item.
- C. Provide screws with accessories designated for screw attachment.
- D. Connector Devices:
  - 1. Vertical Deflection Clips: VertiClip®, including step bushings. Rigid attachment to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement. 68 mils minimum thickness, size as noted.
  - 2. Drift System Clips: DriftClip™, including step bushings. 68 mils (1.72 mm) minimum thickness, size as required by structural design calculations.
    - a. Screw attachment to stud web using step-bushings to permit frictionless vertical movement.
    - b. Screw attachment to structure using step-bushings to permit frictionless movement in the plane of the wall.
  - 3. Rigid Clip Angles: StiffClip™. Rigid attachment to structure and stud web.
  - 4. Floor Ties: Floor to floor strap ties, 2 inches thick. Screw attachment to stud flanges. Length as required by structural design calculations.
  - 5. Hip Angle-135 degree: Rigid attachment to webs of hip framing members. Length and thickness as required by structural design calculations.
  - 6. Roof Ties: Fabricate for screw attachment to joist web and top track/stud flanges. Size and thickness as required by structural design calculations.

E. Bridging:

1. Cold rolled Channel: 1-1/2 by 1/2 inch by 56 mil thick.
  - a. Bridging Clip: BridgeClip®. Provide attachment through stud punch-out clamping onto stud web and wrapping around bridging channel. Provide holes for screw attachment to stud web and channel.
2. Flat Strap. Width and thickness as required by structural design calculations. Rigid attachment to stud flange.
3. Solid Bridging: Channel shaped bridging with lipped flanges and integral formed clips. Screw attachment to stud. 33 mils minimum thickness, size as required by structural design calculations.
4. Cross Bridging: Fabricate members for specific joist depth and spacing with one screw to each joist flange and one to each joist web. Provide bridging sized to joist depth and spacing, 36 mils minimum thickness, as required by structural design calculations.

F. Miscellaneous Items:

1. Joist Hangers: Rigid attachment to structure and joist web, 68 mils (1.72 mm) thick. Provide hanger type and size as required by structural design calculations.
2. Joist Plate: Hole reinforcing plates designed for screw attachment to joist or stud webs. Provide size and thickness as required by structural design calculations.
3. Web Stiffeners: Channel shaped stiffener. Screw attachment to joist or stud webs. Provide size and thickness as required by structural design calculations.

2.04 Fasteners

- A. Screws: Corrosion resistant coated, self-drilling, pan or hex washer head. Provide screw type and size as required by structural design calculations, or as recommended by The STEEL Network for the specific condition and thickness of materials being joined.
- B. Anchor Bolts and Studs: ASTM A 307, Grade A, carbon steel, with hex-head carbon steel nuts and flat steel washers. Hot-dip zinc coated in accordance with ASTM A 153. Provide bolt or stud type and size as required by structural design calculations.
- C. Expansion Anchors: Federal Specification FF-S-325, Group II, Type 4, Class 1. Provide bolts listed or approved by one or more of the following and of diameter and length as required by structural design calculations.
  1. International Conference of Building Officials.



- D. Powder Actuated Fasteners: Federal Specification FF-P-395b. Manufacturer from AISI 1062 or 1065 steel, austempered to a minimum core hardness of 50 to 54 HRC and zinc plated in accordance with ASTM B 633. Provide fasteners listed or approved by one or more of the following and of type, diameter and length as required by structural design calculations:
  - 1. International Conference of Building Officials.

## 2.05 Miscellaneous Materials

- A. Galvanizing Repair Compound: SSPC-Paint 20, spray-can applicator.

## 2.06 Fabrication

- A. Shop Assembly: Fabricate assemblies to size and configuration required; fitted and connected to meet design requirements.
  - 1. Assemble in largest practical sections for delivery to site.
  - 2. Reinforce and brace assemblies to withstand handling stresses.

## **PART 3 - EXECUTION**

### 3.01 Examination

- A. Examine substrates upon which work will be installed.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

### 3.02 General Installation

- A. Install cold-formed metal framing plumb, square, true to line and securely fastened as required by structural design calculations.
- B. Following manufacturer's installation instructions. If installation instructions conflict with these specifications or Drawings, adhere to specifications or Drawings.
- C. Cut members by shearing or sawing.
- D. Install members in single piece lengths except that tracks may be spliced, butt-welded, or each length anchored to a common building frame element.

- E. Install insulation in framing spaces of insulated assemblies made inaccessible after erection.
- F. Repairs and Touch-Up: Clean damaged surfaces and coatings. Touch-up field welds and damaged galvanized surfaces with galvanizing repair compound.
- G. Tolerances:
  - 1. Variation from plumb, level, and true to line: 1/8 inch in 10 feet (1:960).
  - 2. Member Spacing: Not more than 1/8 inch (3 mm) plus or minus from spacing indicated.

### 3.03 Framing Member Installation

- A. Studs:
  - 1. Secure bottom and top tracks in place as required by structural design calculations.
  - 2. Install studs at spacing as shown on Drawings, at each side of openings, and not more than 2 inches from abutting walls.
    - a. Frame corners with three studs.
    - b. Frame wall openings wider than stud spacing with double stud at each jamb.
  - 3. Install supplementary framing or blocking to support work attached to framing. Where type of support is not shown, comply with industry standards.

### 3.04 Framing Accessory Installation

- A. Install accessories as required by structural design calculations. Provide appropriate fasteners in all predrilled holes backed by another framing member.
  - 1. Bridging Clip for Cold Rolled Channel Bridging: Secure to stud web by inserting tabs through web slots and with 2 screws. Secure to channel with one screw.

### 3.05 Cleaning

- A. Reference Section 01740-Cleaning.

End of Section

## SECTION 05500 - MISCELLANEOUS METALS

### PART 1 - SCOPE

- A. This Section includes the furnishing and installation of all miscellaneous metal items required for the project as shown on the Drawings and specified herein.

### PART 2 - COORDINATION

- A. Coordinate furnishing of items specified hereunder with work of other trades so that progress of related work is not delayed.
- B. Take field measurements at the job as necessary to insure fit.

### PART 3 - MATERIALS

- A. Stock or manufacturer's standard items shall be as described under individual item specifications hereunder.
- B. Fabricated items, made especially for this project, shall meet general materials specifications as listed hereunder. Materials shall be of the type, class, temper, etc., which best suit intended uses.
  - 1. Steel shall conform to ASTM Specification A-7 or A-36 for structural steel. Architectural and miscellaneous steel not otherwise indicated or specified shall be mild steel.

Shop Drawings and Data: Show complete details and instructions for fabrication, assembly, and installation. Locate anchor bolts required for installation in other work.

Inserts and Anchorages: Furnish inserts and anchoring devices to be built into other work for installation of miscellaneous metal items.

Steel Plates, Shapes, Bars: ASTM A 36

Tubular Steel Items: Square and rectangular, ASTM A 501; pipe, ASTM A 120.

Cold-Rolled Steel Sheets: ASTM A 366.

Galvanized Steel Sheets: ASTM A 526, with ASTM A 525 G90 zinc coating.

Concrete Inserts: Malleable iron (ASTM A 47) or cast steel (ASTM A 27) inserts, with steel bolts, washers and shims; hot dip galvanized.

Shop Paint: FS TT-P-86, Type 2; or, SSPC-Paint 14. Apply to prepared steel surfaces at rate to provide a 2.0-mil dry film thickness.

Galvanizing: ASTM A 386 for assembled products; A 153 for iron and steel hardware.

Fabrication, General: Use materials of size and thickness shown. Shop-paint all items not specified to be galvanized after fabrication.

Curb Edge Bars: Fabricate of shapes as shown; miter corners and weld joints. Provide anchors 6" from ends of corners and 24" o.c.

Loose Bearing Plates: Provide for steel items bearing on masonry or concrete, as shown. Drill plates to receive anchor bolts.

Miscellaneous Framing and Supports: Provide as required to complete work and not included with structural steel framework.

Steel Pipe Railings: Fabricate to dimensions shown, with smooth bends and welded joints. Use 1-1/2" steel pipe unless otherwise shown.

Installation: Perform cutting, drilling, and fitting required for installation; set work accurately in location, alignment and elevation, measured from established lines and levels. Provide anchorage devices and fasteners where necessary for installation to other work.

#### **PART 4 - SHOP PAINTING AND PROTECTIVE COATING**

- A. All ferrous metal shall be properly cleaned and given one shop coat of red lead, zinc chromate, or other approved rust resisting paint. Anchors that are built into masonry or concrete shall be coated with asphalt paint unless specified to be galvanized. Where galvanized or zinc coated metal is required, it shall not be shop primed unless specifically called for, but all abraded places and welding shall be touched up with aluminum paint. No prime coat is required for non-ferrous metal.
- B. Where hot-dip galvanized or hot zinc coating is specified, it shall be done in accordance with the Standard Specifications of the American Hot Dip Galvanizers Association.

#### **PART 5 - FASTENINGS**

- A. Welding. Perform all welding in accordance with American Welding Society publication AWS D1.0, latest edition with current supplements and addenda.
  - 1. Welds shall be made only by operators experienced in performing the type work indicated.
  - 2. Welds normally exposed to view in the finished work shall be uniformly made and ground smooth.

3. Where welding is done in proximity to glass or finished surfaces, such surfaces shall be protected from damage due to weld sparks or spatter.
- B. Bolted Screwed, and Riveted Connections. In general, use bolts for field connections only as directed. Provide washers under all heads and nuts bearing on wood. Draw all nuts tight and nick threads of permanent connections to prevent loosening. Use beveled washers where bearing is on sloped surfaces.
1. Where screws must be used for permanent connection in ferrous metal, use flat head type, countersunk.
  2. Where rivets are used, they shall be machine driven, tight, heads centered, countersunk and finished flush and smooth.

## **PART 6 - MISCELLANEOUS ITEMS**

- A. Anchoring Devices. Furnish all miscellaneous metal anchoring devices required to be built into concrete or masonry or welded to steel framing members for anchorage of collateral work which are not specified to be furnished under other sections of the Specifications. Items include, but are not necessarily limited to the following:
1. Anchor bolts for miscellaneous anchorage built into concrete or masonry not furnished under work of structural steel shall be hex-head steel machine bolts of sizes shown in the details, shall conform to ASTM A354, and shall be furnished with nuts and plate washers of size to suit the particular application.
- B. Loose Lintels. Furnish all loose steel angle and/or plate lintels not furnished as part of structural steel under work of Section 05120 as required for support of masonry over openings. Members shall be of sizes shown, and, unless otherwise indicated, shall have minimum bearing at each end of 8".

End of Section