

SECTION 05 12 23

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. This section shall cover the furnishing, fabrication, erection and connection of all structural steel complete.

1.2 WORK INCLUDED & FURNISHED

- A. All labor, tools, materials, scaffolding, bracing, cranes, hoist, and other construction equipment required for the completion of the structure.
- B. Preparation of shop drawings.
- C. Furnishing and fabrication of all structural steel and miscellaneous metal work including beams, columns base plates, cap plates, bearing plates, angles, struts, bracing, girts, girders, connection material, fasteners, anchor bolts, shims, loose lintels, stiffeners, hangers, brackets, rods, and welding material.
- D. Shop and field painting.
- E. Shop and field connections including temporary bracing.
- F. Section 01 40 00 – Quality Control: Required Special Inspections

1.3 QUALITY ASSURANCE

- A. Fabricator's Qualifications: **A qualified fabricator that is AISC Certified for conventional steel building structures. If fabricator is not an AISC certified plant, then the fabricator must meet the protocol for special inspection requirements of IBC, Section 1704, paragraphs 1704.2.5 and 1704.2.5.1.** Documentation that one of the above requirements is met must be submitted to the Architect before starting shop drawings.

1.4 RELATED SECTIONS

- A. Section 01 40 00 – Required Special Inspections
- B. Section 03 30 00- Cast-in-Place Concrete
- C. Section 05 50 00 - Metal Fabrications

1.5 FURNISHED BUT INSTALLED ELSEWHERE

- A. Anchor Bolts, Loose Bearing Plates: Refer to Sections 2 and 7d of AISC Code of Standard Practice.
- B. Loose Lintels: Refer to Section 7f of AISC Code of Standard Practice.

1.6 STANDARDS

- A. Structural Steel fabrication, connections, detailing and erection shall be in accordance with the specifications for the "Design Fabrication and Erection of the AISC Manual of Steel Construction, unless indicated otherwise in these specifications or on plans.
- B. All structural steel shall conform to standard specifications for structural steel, ASTM A36, except:
 - Wide Flanges and WT Tees - ASTM A992, $F_y=50$ ksi
 - 1. Structural steel tubing - ASTM A500, $F_y=50$ ksi.
 - 2. Structural Steel Pipe - ASTM A501, $F_y=35$ ksi.
 - 3. Anchor Rods – ASTM F1554, Grade 36
 - 4. Headed Stud Anchors - ASTM A108, $F_y=50$ ksi.
 - 5. High Strength Bolts – ASTM A325

1.7 SHOP DRAWINGS

- A. Comply with Section 01 33 00. When corrections are required, reproducibles will be returned noting such. Drawings will then be corrected and resubmitted until final approval is received. Items not noted as requiring corrections may be fabricated after return of a previous submittal even though drawings shall be such that corrections noted on one sheet that affect another drawing will be transmitted and made on all sheets and also resubmitted.
- B. The Contractor will be responsible for checking quantities and dimensions in accordance with contract drawings. Where discrepancies in dimensions are noted, the Contractor shall notify the Architect of such discrepancies and corrected dimensions then will be furnished by the Architect. Contractor shall coordinate any dimension changes or additions with fabricator.
- C. Contract drawings receive precedence over shop drawings unless authorized in writing. Approval of shop drawings does not grant authorization of change to contract.
- D. Standard AWS symbols shall be used and shown for all welded connection details for both shop and field welds. Joint reference numbers as noted in part 4 of 7th Edition of AISC "Manual of Steel Construction" shall be shown where full strength welds are required.
- E. All splices and connections, both shop and field, shall be detailed on shop drawings.

1.8 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.
- 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 weather-tight and dry place, until ready for use in the work.
 - 4. Packaged materials shall be stored in their original unbroken package or container.

1.9 COOPERATION WITH OTHER WORK

- A. Fabricator shall punch all necessary holes and provide the connection material required for the attachment of miscellaneous items, such as nailers, hangers and mechanical equipment framing. Contractor shall coordinate such work with all plans.

1.10 WORKMANSHIP

- A. All welding, both shop and field welding, shall be made by welders qualified by tests as prescribed in the "Code for Welding in Building Construction" (AWS D1.1-Current Edition).
- B. All fabrication and erection work shall be performed by skilled workmen, working under experienced supervision.

1.11 UNIT PRICES

- A. Provide allowance of \$10,000 per ton for one (1) ton of miscellaneous beams, channels, and angles in addition to the steel framing shown on the plans and details. Contractor shall include additional allowance cost for fabrication, design, installation and erection cost for the additional framing. Construction Manager is to record use and credit back unused cost to Owner.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All structural steel shall meet the specifications for "Structural Steel" (ASTM A36). Except wide flanges and tees shall conform to ASTM A992, $F_y=50$ ksi, steel tubes shall conform to ASTM A500, Grade C, $F_y=50$ KSI, and steel pipe shall conform to ASTM A501.
- B. Filler Metal for Welding shall conform to one of the following:
 - 1. Manual Shielded Metal Arc Welding - E70 Series of the "Specifications for Mild Steel covered Welding Electrodes" (AWS A51-Current Edition).
 - 2. Submerged Arc Welding - F70 AWS-flux Series of the "Specifications for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding" AWS 5.17-96.
- C. Bolts
 - 1. High Strength Bolts shall be A325 bolts meeting the requirements of "Specification for Structural Joints Using ASTM A325 or A490 Bolts", including suitable nuts and plain hardened washers.
 - 2. Other bolts shall conform to "Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners" (ASTM A307).

2.2 CONNECTIONS

- A. Type
 - 1. Unless indicated and detailed otherwise on plans, all connections shall be detailed and designed by the fabricator as unrestrained flexible connections described as Type 2 construction in Section A2.2 of the most current edition of the AISC manual of Steel Construction, but provisions must be made for excessive eccentric connections. All connections shall be in accordance with Part 4 and Part 5 of the above cited AISC Manual.
 - 2. Bolted Connections
 - a. All bolted connections, unless noted otherwise, shall be A325 high strength steel bolts, nuts and harden washers, conforming to the "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
 - b. All bolted connections, unless noted otherwise, shall be of bearing type with threads included in the shear planes. These bolts shall be snug tightened. The snug-tight condition is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
 - c. Bolts, nuts and washers shall conform to Tables 1 and 5 of Specifications and Commentary for "Structural Joints, Using ASTM A325 or A490 Bolts" of Current Edition of AISC Manual of Steel Construction.
 - d. Bolted parts shall be fitted tightly together before bolt installation.
 - e. All bolts shall have one nut and a hardened washer under the turning element.
 - f. When surface of bolted part in contact with nut or bolt head exceeds a slope of 1:20 with respect to a plane normal to the bolt axis, smooth beveled washers shall be used.

- g. Bolt assembly and contact surfaces shall be free from scale, burrs, dirt and other foreign matter which might prevent solid seating.
 - h. Minimum bolt size, unless noted otherwise, shall be 5/8" in diameter. Adequate "stick through" for bolts must be provided in accordance with section C2 and Table 6, pages 5-201 and 5-202 of reference cited in part c) of the section.
 - i. All bolts at the column cap plates shall be installed with the bolt on top and the nut below the cap plate.
3. Welded
- a. Minimum size of fillet weld permitted shall be 3/16", unless noted otherwise.
 - b. All surfaces to be welded shall be free from loose scale, slag, rust, grease, paint and other foreign materials.
 - c. All welding shall be in accordance with AWS "Structural Welding Code" (AWS D1.1-Current Edition) and as illustrates and described in "Welded Joints" in Part 4 of the 7th edition of the AISC Manual of Steel Construction.
 - d. Shop welding and field welding shall be performed by a certified welder in accordance with AWS D1.1-2000, licensed in the State of Arkansas.

PART 3 EXECUTIONS

3.1 FABRICATION

A. Connections and Splices

- 1. Shop connections and splices may be bolted or welded.
- 2. All holes for bolts shall be punched or drilled without ragged or torn edges. Finished holes for bolts shall be 1/16 inch larger than nominal diameter of the bolt.

B. Metal Preparation

- 1. All metal shall be properly prepared before shop connections are made in accordance with welding and bolting requirements of these specifications, AISC and AWS standards.
- 2. All completed members shall be straight, without kinks, twists, bulges, bends and open joints.
- 3. Shearing, punching and cutting of materials shall be without torn or ragged edges.
- 4. Holes too small to meet above requirements shall be enlarged without distortion to the metal by reaming.
- 5. Bolted parts, when assembled, shall be fabricated so that the bolts will enter without distortion.
- 6. Compression members shall have milled or sawed shop ends and joints.
- 7. Open holes necessary for connection of other work shall be provided at time of fabrication. Contractor shall coordinate work with that of other trades.
- 8. Grind all factory or field welds where exposed to achieve smooth consistent surface. Field-apply primer (or galvanized paint if metal is galvanized) immediately following grinding.

C. Painting

1. All steel work except that encased in concrete or otherwise noted, shall receive one shop coat of a rust inhibitive paint meeting Federal Specification TT-P-636 with a minimum dry paint film thickness of 2.0 mils.
2. All metal shall be free of dirt, grease, rust, mill scale, oil and other foreign material, and shall be wire brushed before painting.

D. Tolerances

1. Fabrication tolerances shall be in accordance with AISC Manual of Steel Construction- Current Edition.

3.2 ERECTION

A. Precautions

1. The Contractor shall take necessary precautions to secure all steel against movement during erection and that bracing as noted in the remainder of this section of the specifications is installed.

B. Field Connections

1. Field connections may be either welded or bolted.
2. As erection work progresses, all steel work shall be secured and fastened with either temporary or permanent connections.
3. Bolts exposed to weathering or to earth shall be dipped in a rust inhibitive paint prior to installation.
4. 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.
5. All beams with or without bearing plates shall be set in 1 to 1 mix of sand and Portland cement so as to ensure full contact bearing.

C. Bracing - All structural steel shall be braced, guyed and stayed to prevent lateral or vertical movement against construction loads, dead loads, wind forces and erection forces. Such bracing shall remain in place until secured and all exterior walls are in place.

D. Field Painting

1. Damage of shop paint or exposed rusted metal spots shall be cleaned and painted before erection. Paint shall be same as applied by fabricator.
2. After erection, all steel exposed to earth or weather shall be painted with a 2nd coat of rust inhibitive paint.
3. After erection, all abrasions or damaged paint marks, including bolts, nuts and welds, shall be touched up with shop paint by the erector.
4. See Section 09 91 00 for finish coats required.

E. Tolerances - Erection tolerances shall conform to part b) of section 7 of AISC "Code of Standard Practice for Steel Buildings and Bridges", as stated in the 7th Edition of AISC Manual of Steel Construction or most current edition.

3.3 IMPROPER FIT OF STEEL WORK

- A. All framing or connections that do not properly fit, or are not located according to plans, shall be modified or replaced at contractor's expense. Contractor shall submit to the Architect drawings and proposals for modifications and replacement, for approval. No work shall proceed until approval is received, but temporary shoring and bracing shall be placed until approved corrections are made.

3.4 SPECIAL INSPECTIONS

- A. Inspection of Steel structure placement and connections for conformance to the construction documents and the IBC shall be completed by the designated third-party Special Inspector.

END OF SECTION

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