

DIVISION 5 - STEEL
SECTION 05 12 00 - STRUCTURAL STEEL
PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Furnish anchor bolts (installation and grouting by others). Provide templates.
- B. Furnish and set leveling plates (grouting by others).
- C. Furnish structural steel framing, in place; including columns, beams, cross-bracing, girts, sag rods, etc.
- D. Field Priming.

1.2 REFERENCES

- A. AISC – Manual of Steel Construction, Load and Resistance Factor Design
- B. AISC – Manual of Steel Construction, Allowable Stress Design
- C. AISC – Specification for the Design, Fabrication and Erection of Structural Steel for Buildings
- D. AISC – Specification for the Design of Steel Hollow Structural Sections
- E. AISC – Specification for Structural Joints Using ASTM A325 or A490 Bolts
- F. ASTM A36, A992, A572 – Structural Steel
- G. ASTM A53 – Black and Hot-Dipped Zinc-coated, Welded and Seamless Steel Pipe
- H. ASTM A108 – Steel Bars, Carbon, Cold-Finished, Standard Quality
- I. ASTM A123/A123M – Zinc-Coating on Iron and Steel Products
- J. ASTM A143 – Safeguarding Against Embrittlement.
- K. ASTM A153 – Standard Specification for Zinc (Hot Dip Galvanizing) on Iron and Steel Hardware.
- L. ASTM A307 – Carbon Steel Externally Threaded Standard Fasteners
- M. ASTM A325 – High Strength Bolts for Structural Steel Joints
- N. ASTM A500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- O. ASTM A780 – Repair of Hot-Dip Galvanizing
- P. AWS – Structural Welding Code
- Q. Code of Standard Practice for Steel Buildings and Bridges
- R. SSPC – Steel Structures Painting Council.

1.3 DESIGN REQUIREMENTS

- A. Design of connections not detailed on the Drawings is to be under direct supervision of a Professional Structural Contractor experienced in design of this work and licensed in the State where the Project is located. Reactions are shown on the Drawings. When reactions are not shown design structural connections to support the member uniformly loaded to its capacity.

1.4 SUBMITTALS

- A. Fabrication shop drawings for all items.
- B. Calculations for connections, submitted for record purposes only.
- C. Bolt and washer data with tightening method.
- D. Primer paint data.

1.5 QUALIFICATIONS

- A. Fabricator: A company, with a minimum 10 years experience, specializing in the fabrication of the specified materials.
- B. Erector: A company, with a minimum 10 years experience, specializing in the erection of similar structures.
- C. Welder's Certificates: For each welder employed in this work, submit a certificate verifying AWS qualification within the previous 12 months.
- D. Galvanizer: A company, with a minimum of 5 years experience, specializing in the performance of the specified galvanizing processes. Galvanizing facility must have an ongoing QA/QC program and an on-site testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

1.6 WARRANTY

- A. In accordance with the General Conditions of the Construction Contract.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural Steel: ASTM A992 or ASTM A572, Gr. 50 with special requirements per AISC Technical Bulletin #3, New Shape Material. Miscellaneous angles and embedded channels per ASTM A36 unless otherwise noted. Structural steel tubing shall conform to A500, Grade B.
- B. All steel columns adjacent to or embedded in masonry shall be provided with deformed bar anchors (DBAs) to match size, quantity and spacing of horizontal reinforcement shown in the structural drawings.
- C. Bolts: ASTM A325N or A325SC, with hardened steel washers.
- D. Welding Materials: Table 3.1 of AWS D1.1; of type as appropriate for materials being welded.
- E. Shear Studs: Stud type shear connectors shall be of a design suitable for electrical end welding to steel either by stick welding or with automatically timed stud welding equipment. Flux shall be supplied with each stud, as required by the weld method. Stud connectors shall conform to ASTM A108, Grade 1015, 1018 or 1020, GPM or fully killed. If flux-retaining caps are used, the studs shall be low carbon steel complying with ASTM A109.
- F. Sag Rods: Girt sag rods shall be A36. Thread at the ends only to the distance required for nut and washer thread engagement.
- G. Anchor Bolts: Shall be F1554, Grade 36, unless otherwise noted on the Drawings.
- H. Steel Base Plates: Shall be ASTM A572, Grade 50.

2.2 PAINTING

- A. After inspection and before leaving the shop, thoroughly clean steel of all loose mill scale, rust spatter, slag or flux deposits, oil, dirt and other foreign matter. Clean and prepare for painting in accordance with SSPC, SP-3 (Power tool cleaning). Apply one coat of light gray shop primer.

2.3 GALVANIZING

- A. All structural steel exposed to the exterior of the structure's envelope, after erection, shall be hot-dip galvanized, unless otherwise noted.
 - 1. Items shall be galvanized after fabrication. Where size of assembly is too large for complete unit galvanizing, these assemblies shall be galvanized prior to fabrication, in as large sections as practical.
 - 2. Where galvanizing prior to completing fabrication cannot be avoided, steel surface shall be cleaned by SSPC SP-6, joints shall be welded after fabrication, ground smooth and finished with 4 full coats of ZRC Cold Galvanizing Compound by ZRC Worldwide, ZIRP by Duncan Galvanizing or equal conforming to ASTM A780.
- B. Galvanize steel members, fabrications and assemblies after fabrication by the hot-dip process in accordance with ASTM A123/123M.
- C. Galvanize bolts, nuts, washers, and iron and steel hardware components in accordance with ASTM A153/153M.
- D. Safeguard products against steel embrittlement in conformance with ASTM A143.
- E. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
- F. Conform to paragraph 6.1 of ASTM A123/123M, Table 1 of ASTM A153/153M, or Table 2 of A767, as appropriate.
- G. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free of any defect detrimental to the stated end use of the coated article.
- H. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.
- I. Touch-Up and Repair: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas.
 - 1. Apply organic zinc repair paint complying with requirements of ASTM A780. Galvanizing repair paint shall have 95 percent zinc by weight. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A123 or A153, as applicable. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, brite paint or aluminum paint is not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and ready to receive work. Ensure that dimensions agree with Drawings.
- B. Special attention shall be given to verification of stubbed-up bolts at foundations, embedded or other anchorage items, etc.

3.2 FABRICATION

- A. All work shall be fabricated in accordance with reviewed shop drawings; review of shop drawings by the Contractor is for design intent only.

- B. Review of shop drawings does not relieve the subcontractor of his responsibility for correct fabrication as designed.
- C. All items shall be fabricated true, plumb and level; all units shall be welded and/or bolted to develop the full strength of the assembly, as designed.
- D. Punch and/or drill steel for attachment of wood nailers or other materials indicated or specified to be attached to the steel.
- E. Joints shall be accurately cut, mitered, and connected as designed.
- F. Where appropriate, welded joints shall be ground smooth.

3.3 ERECTION

- A. All work shall be erected in accordance with reviewed shop drawings; review of shop drawings by Contractor is for design intent only.
 - 1. Review of shop drawings shall not relieve the subcontractor of his responsibility for correct erection as designed.
- B. All steel framing members shall be set with instruments to assure accuracy of line, and a plumb and level installation.
 - 1. No alteration shall be made to members without the approval of the Contractor.
 - 2. This subcontractor shall be responsible for all errors in fabrication and for the correct fitting of all members.
- C. Safety during erection is the responsibility of this subcontractor.
- D. All temporary supports and bracing shall be provided as necessary to stabilize steel framing, and to safely maintain all loads imposed during erection. The structure shall not be considered stable until fully detailed with all bridging, decking, moment connections and cross bracing is installed.

3.4 CONNECTIONS

- A. Welded and bolted connections are to be as detailed and shall conform to appropriate AWS and AISC Requirements.
- B. Where structural joints are made using high strength bolts, the materials, methods of installation and tension control, type of wrenches to be used and the inspection methods shall conform to "Specifications for Structural Joints Using ASTM A325 or A490 Bolts" as approved by the Research Council on Structural Connection.
 - 1. The high strength bolts used shall have a suitable identifying mark placed on top of the head before leaving the factory.
 - 2. Pre-tensioning of bolts when required shall comply with Specification for Structural Joints using ASTM A325 or A490.
 - 3. Bolts that have been completely tightened shall be marked with an identifying symbol.
 - 4. The use of "twist off" type tension control structural bolts conforming to ASTM F1852 shall be acceptable, subject to verification and inspection procedures outlined in Specification for Structural Joints using ASTM A325 and A490 bolts.
 - 5. The use of direct-tension-indicators meeting the requirements of ASTM F959 shall be acceptable subject to verification and inspection procedures outlined in Specification for Structural Joints using ASTM A325 and A490 bolts.

3.5 FIELD QUALITY CONTROL

- A. The Design-Builder will retain a Special Inspector to perform observations in accordance with IBC. See Structural drawings for additional Special Inspector requirements. Duties will include, but not be limited to:
 - 1. Review of Plans, Specifications and Shop Drawings.
 - 2. Review shop and field personnel qualifications for work required.
 - 3. Review welding procedures and verify adequacy of equipment for work required.
 - 4. Review welding consumables for compliance of welding procedures for work required.
 - 5. Perform testing of plumbness of the steel frame for compliance with AISC allowable tolerances.
 - 6. Writing and submitting a daily report to the Design-Builder that describes the tests and observations made and describe any actions taken to correct nonconforming work. All deviations from Plans or Specifications will be specifically noted.
- B. This subcontractor shall cooperate with the Special Inspector and provide free access to all Work.
- C. Welds shall comply with AWS Standards for Visual Inspection; the Special Inspector may, at his discretion, employ any additional, commonly accepted test method which he feels is necessary for a specific situation.
- D. Any necessary corrective measures, and re-inspection, will be performed at this subcontractor's expense.

3.6 TOLERANCES

- A. Maximum allowable variation for plumb, level, and alignment shall be in accordance with appropriate AISC Requirements.

3.7 FINISH

- A. After erection, this subcontractor shall remove all mud, stains, etc. from erected steel. This subcontractor shall then touch-up field connections and abraded places where coating has been damaged.
- B. If painted finish has been damaged, it shall be touched-up with the same paint used for the shop primer coat. Aerosol spray is not acceptable.
- C. If galvanized finish has been damaged, it shall be touched-up as described above.

PART 4 COMPLETION

4.1 CLEANUP

- A. All work shall be left clean and undamaged, ready for finish, as appropriate, under Separate Sections.

END OF SECTION