# SECTION 05 1200 - STRUCTURAL STEEL FRAMING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Structural steel framing members, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

B. Base plates.

C. Grouting under base plates.

### 1.02 RELATED REQUIREMENTS

A. Section 05 2100 - Steel Joist Framing.

B. Section 05 3100 - Steel Decking: Support framing for small openings in deck.

C. Section 05 5100 – Metal Stairs.

### 1.03 REFERENCE STANDARDS (LATEST EDITION)

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc..

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc..

C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

H. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

I. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel.

J. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

K. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

L. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

M. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 ksi Minimum Tensile Strength.

N. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

O. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

P. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.

Q. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

R. ASTM E94 - Standard Guide for Radiographic Examination.

S. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.

T. ASTM E165 - Standard Test Method for Liquid Penetrant Examination for General Industry.

U. ASTM E709 - Standard Guide for Magnetic Particle Testing.

V. ASTM F436 - Standard Specification for Hardened Steel Washers.

W. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

X. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

Y. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.

Z. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.

**1.04 PERFORMANCE REQUIREMENTS**

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

**1.05 SUBMITTALS**

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Show fabrication of structural steel components.
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners. Include details of cuts, connections, splices, holes, and other pertinent data.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols, distinguishing between shop and field welds. Indicate weld lengths, size, and type of each weld.
   5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   6. Include embedment drawings.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   3. Shop primers.

4. Non-shrink grout.

D. Qualification Data: Upon Architect's request, provide qualification data for fabricator, erector and professional engineer responsible for specific design.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

### 1.06 QUALITY ASSURANCE

A. Fabricate and erect structural steel members in accordance with AISC "Steel Construction Manual."

B. Comply with AISC "Code of Standard Practice for Steel Buildings and Bridges".

C. Fabricator: A qualified company who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd. Fabricator not meeting the AISC certification shall submit qualifications showing similar experience in fabrication of structural steel similar to that indicated for this Project and with a minimum five years of documented successful in-service performance for Engineer's approval.

D. Erector: A qualified company who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE. Structural steel erector not meeting the AISC certification shall submit qualifications showing similar experience in structural steel installation similar to that indicated for this Project and with a minimum five years of documented successful in-service performance for Engineer's approval.

E. Welding: Qualify procedures and personnel according to AWS D1.1.

F. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
   1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
   2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

### 1.08 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## PART 2 PRODUCTS

### 2.01 MATERIALS

A. Steel Angles, Plates, Bars, S-Shapes, and Channels: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M, Grade 50

C. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B, structural tubing.

D. Pipe: ASTM A53/A53M, Type E or S, Grade B.

E. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, heavy hex steel structural bolts, ; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

F. High-Strength Structural Bolts: ASTM A490 (ASTM A490M), Type 1, heavy hex steel structural steel bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

G. Headed Anchor Rods: ASTM F1554, Grade 36, plain, straight.
   1. Nuts: ASTM A563 heavy hex carbon-steel.
   2. Embedded Plate Washers: ASTM A36 carbon-steel.
   3. Washers: ASTM F436 hardened carbon-steel.

H. Threaded Rods: ASTM A36.
   1. Nuts: ASTM A563 heavy hex carbon-steel.
   2. Plate Washers: ASTM A36 carbon-steel.

I. Welding Materials: AWS D1.1; type required for materials being welded.

J. Slide Bearing Plates: Teflon coated.

K. Grout: Non-shrink, non-metallic aggregate type, factory-packaged, non-corrosive, non-staining, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days. Mix with water to consistency suitable for application and a 30-minute working time.

L. Shop and Touch-Up Primer: Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer, complying with VOC limitations of authorities having jurisdiction.

M. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction; ASTM A780.

**2.02 FABRICATION**

A. Structural Steel: Shop fabricate and assemble to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Steel Construction Manual."
   1. Camber structural steel members where indicated.
   2. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
   3. Mark and match-mark materials for field assembly.
   4. Complete structural steel assemblies, including welding of units, before starting shop priming operations.
   5. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to comply with the requirements in AWS D1.1.

C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

D. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work. Continuously seal joined members by continuous welds.
   1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

E. Fabricate connections for bolt, nut, and washer connectors.

F. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

G. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug-tightened, unless indicated otherwise.

**2.03 FINISH**

A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete or mortar (extend priming of partially embedded members to a depth of 2 inches), galvanized surfaces, or high strength bolted.

B. Painting: Apply a 1-coat, non-asphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

C. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123.
   1. Fill vent holes and grind smooth after galvanizing.
   2. Galvanize lintels and shelf angles attached to structural steel frame and located in exterior walls.

**2.04 SOURCE QUALITY CONTROL**

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 10 percent of bolts at each connection.

B. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

### 3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Steel Construction Manual".
   1. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges".
   2. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean earing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
      a. Level and plumb individual members of structure.
      b. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Weld Connections: Field weld components indicated on shop drawings. Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work. Continuously seal joined members by continuous welds.
   1. Comply with AISC "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Steel Construction Manual" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
   2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. Do not field cut or alter structural members without approval of Structural Engineer.

F. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

H. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
   1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

I. Splice members only where indicated.

J. Do not enlarge holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

K. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug-tightened, unless indicated otherwise.

**3.04 FIELD QUALITY CONTROL**

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 10 percent of bolts at each connection.

C. Welded Connections: Visually inspect all field-welded connections and test at least 10 percent of welds using one of the following:
1. Radiographic testing performed in accordance with ASTM E94.
2. Ultrasonic testing performed in accordance with ASTM E164.
3. Liquid penetrant inspection performed in accordance with ASTM E165.
4. Magnetic particle inspection performed in accordance with ASTM E709.

**3.05 REPAIRS AND PROTECTION**

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASM A780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

## END OF SECTION