

**SECTION 05 12 00  
STRUCTURAL STEEL FRAMING**

SPEC WRITER NOTE: Delete text between  
// \_\_\_\_\_ // not applicable to project.  
Edit remaining text to suit project.

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Structural steel shapes, plates, and bars.
  2. Structural pipe.
  3. Bolts, nuts, and washers.

**1.2 RELATED REQUIREMENTS**

SPEC WRITER NOTE: Update and retain  
references only when specified elsewhere  
in this section.

- A. Materials Testing And Inspection During Construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Roof Decks Framing: Section 03 51 16, GYPSUM CONCRETE ROOF DECKS.
- C. Floor Decks Framing: Section 03 55 11, GYPSUM CONCRETE FLOOR DECKS.
- D. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.
- E. Steel Decking: Section 05 31 00, STEEL DECKING.
- F. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.
- G. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.
- H. Steel Framing: // Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS //  
Section 13 34 19, METAL BUILDING SYSTEMS //.
- I. Steel Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- J. Steel Support: Section 10 13 00, DIRECTORIES.
- K. Painting: Section 09 91 00, PAINTING.
- L. Steel Piles: Section 31 62 00, DRIVEN PILES.

SPEC WRITER NOTE: AISC has a certification program confirming that certified structural steel fabricating plant has procedures and commitment to produce fabricated steel of required quality for given category of structural steel framing. Consider deleting category certification if there is minimal amount of steel required. Category is STD: Standard for Building Structures.

### 1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Institute of Steel Construction (AISC):
  - 1. AISC Manual - Steel Construction Manual, 14th Ed.
  - 2. 303-10 - Code of Structural Steel Buildings and Bridges.
  - 3. 360-10: Specification for Structural Steel Buildings.
- C. The American Society of Mechanical Engineers (ASME):
  - 1. B18.22.1-09 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers.
- D. American Welding Society (AWS):
  - 1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
- E. ASTM International (ASTM):
  - 1. A6/A6M-14 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
  - 2. A36/A36M-14 - Carbon Structural Steel.
  - 3. A53/A53M-12 - Pipe, Steel, Black and Hot-Dip, Zinc-Coated, Welded and Seamless.
  - 4. A123/A123M-15 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 5. A242/A242M-13 - High-Strength Low-Alloy Structural Steel.
  - 6. A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.
  - 7. A307-14 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
  - 8. A325-14 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 9. A490-14a - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
  - 10. A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.

11. A501/A501M-14 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
  12. A572/A572M-15 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  13. A992/A992M-15 - Structural Shapes.
  14. F2329/F2329M-15 - Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy steel Bolts, Screws, washers, Nuts, and Special Threaded Fasteners.
- F. Master Painters Institute (MPI):
1. No. 18 - Primer, Zinc Rich, Organic.
- G. Military Specifications (Mil. Spec.):
1. MIL-P-21035 - Paint, High Zinc Dust Content, Galvanizing, Repair.
- H. Occupational Safety and Health Administration (OSHA):
1. 29 CFR 1926.752(e) - Guidelines For Establishing The Components Of A Site-Specific Erection Plan.
  2. 29 CFR 1926-2001 - Safety Standards for Steel Erection.
- I. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
1. Specification for Structural Joints Using ASTM A325 or A490 Bolts.

#### 1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
  1. Show size, configuration, and fabrication and installation details.
- C. Sustainable Construction Submittals:

SPEC WRITER NOTE: Retain sustainable construction submittals appropriate to product.

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- D. Test Reports: Certify products comply with specifications.
1. Welders' qualifying tests.
- E. Certificates: Certify each product complies with specifications.
1. Structural steel.
  2. Steel connections.
  3. Welding materials.
  4. Shop coat primer paint.

- F. Qualifications: Substantiate qualifications comply with specifications.
  - 1. Fabricator // with project experience list //.
  - 2. Installer // with project experience list //.
  - 3. Welders and welding procedures.
- G. Delegated Design Drawings and Calculations: Signed and sealed by responsible Architect/Engineer.
  - 1. Connection calculations.

SPEC WRITER NOTE: Include cooling tower supports, only when required and not detailed on structural drawings.

2. // Cooling Tower Supports. //

- H. Record Surveys: Signed and sealed by responsible surveyor or engineer.

### 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: AISC Quality Certification participant designated as AISC Certified Plant, Category STD.
  - 1. Regularly fabricates specified products.
  - 2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.
    - a. // Project Experience List: Provide contact names and addresses for completed projects. //
- B. Installer Qualifications: AISC Quality Certification Program participant designated as AISC-Certified Erector, Category ACSE.
  - 1. Regularly installs specified products.
  - 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
    - a. // Project Experience List: Provide contact names and addresses for completed projects. //
- C. Before commencement of Work, ensure steel erector provides written notification required by OSHA 29 CFR 1926.752(e). Submit a copy of the notification to Contracting Officer's Representative.
- D. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

**1.6 WARRANTY**

SPEC WRITER NOTE: Always retain construction warranty. FAR includes Contractor's one year labor and material warranty.

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

**PART 2 - PRODUCTS****2.1 SYSTEM PERFORMANCE**

- A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where project is located.
- B. Design structural steel framing connections complying with specified performance:
  - 1. Load Capacity: // Resist loads indicated on drawings // Resist full capacity of supported framing member //. Account for connection and member loads and eccentricities.
    - a. Request additional design criteria when necessary to complete connection design.
  - 2. Configuration: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with details shown on drawings, supplementing where necessary. The details shown on drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the Contracting Officer Representative of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the Contracting Officer's Representative. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

SPEC WRITER NOTE: Include cooling tower supports when required for project. Add other specific components requiring delegated design.

- C. Design cooling tower supports meeting specified performance:
1. Coordinate design criteria with cooling tower specified in Section 23 65 00, COOLING TOWERS.
  2. Design Loads: Support operating cooling tower maximum dead load and minimum dead load when combined with lateral loads. Resist wind, snow, // seismic // loads indicated on drawings and supplied by Cooling Tower manufacturer.
  3. Configuration: Design framing member sizes, dimensions, and locations to suit cooling tower load, size, and configuration. Submit detailed drawings and design calculations, prepared by a registered Professional Engineer, for approval before members are fabricated.

## 2.2 MATERIALS

SPEC WRITER NOTE: For each structural steel shape, select reference standard. First two subparagraphs are typical; last subparagraph is considered specialty steel.

- A. W-Shapes:
1. ASTM A992/A992M.
  2. ASTM A572/A572M; Grade // 50 // 60 // 65 //.
  3. ASTM A529; Grade // 50 // 55 //.
- B. // M // S // -Shapes:
1. ASTM A36/A36M.
  2. ASTM A572/A572M; Grade // 50 // 60 // 65 //.
  3. ASTM A529; Grade // 50 // 55 //.
- C. Channel and Angles:
1. ASTM A36/A36M.
  2. ASTM A572/A572M; Grade // 50 // 60 // 65 //.
  3. ASTM A529; Grade // 50 // 55 //.
- D. Plates and Bars:
1. ASTM A36/A36M.
  2. ASTM A572/A572M; Grade // 50 // 60 // 65 //.
  3. ASTM A529; Grade // 50 // 55 //.

## E. Hollow Structural Sections:

SPEC WRITER NOTE: Select first subparagraph for cold formed and second subparagraph for hot formed HSS framing.

1. ASTM A500/A500M.
2. ASTM A501/A501M.

## F. Structural Pipe: ASTM A53/A53M, Grade B.

## G. Bolts, Nuts and Washers: // Galvanized for galvanized framing // and // plain finish for other framing //.

1. High-strength bolts, including nuts and washers: // ASTM A325 // or // ASTM A490 //.
2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ASME B18.22.1.

## H. Welding Materials: AWS D1.1, type to suit application.

**2.3 PRODUCTS - GENERAL**

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Sustainable Construction Requirements:

## SPEC WRITER NOTE:

1 Specify products containing greatest recycled content practicable to maximize material recovery. See EPA Comprehensive Procurement Guidelines (CPG) for guidance about individual products and available recycled content. Section 01 81 13 sets overall project recycled content requirements.

2. Steel recycled content depends upon furnace type. AISC reports industry wide 32 percent for basic oxygen furnace and 93 percent for electric arc furnace.

1. Steel Recycled Content: 30 percent total recycled content, minimum.

**SPEC WRITER NOTE:**

1. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS includes comprehensive product list setting VOC limits for low-emitting materials.
2. Retain subparagraphs applicable to products specified in this section.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
  - a. Paints and coatings.

**2.4 FABRICATION**

- A. Fabricate structural steel according to Chapter M, AISC 360.
- B. Shop and Field Connections:
  1. Weld connections according to AWS D1.1/D1.1M. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
  2. High-Strength Bolts: High-strength bolts tightened to a bolt tension minimum 70 percent of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

**2.5 FINISHES**

**SPEC WRITER NOTE: Retain field painting only when steel is shop primed or galvanized.**

- A. Shop Priming:
  1. Prime paint structural steel according to AISC 303, Section 6.
    - a. Interstitial Space Structural Steel: Prime paint, unless indicated to receive sprayed on fireproofing.
- B. Shop Finish Painting: Apply primer and finish paint as specified in Section 09 91 00, PAINTING.
- C. Do not paint:
  1. Surfaces within 50 mm (2 inches) of field welded joints.
  2. Surfaces indicated to be encased in concrete.



3. Surfaces receiving sprayed on fireproofing.
4. Beam top flanges receiving shear connector studs applied.

SPEC WRITER NOTE: Retain galvanizing for structural steel exterior applications.

- D. Structural Steel Galvanizing: ASTM A123/A123M, hot dipped, after fabrication. Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.
  1. Galvanize structural steel framing installed at exterior locations.
- E. Bolts, Nuts, and Washers Galvanizing: ASTM F2329, hot-dipped.

## 2.6 ACCESSORIES

- A. General: Shop paint steel according to AISC 303, Section 6.
- B. Finish Paint System: Primer and finish as specified in Section 09 91 00, PAINTING.
- C. Galvanizing Repair Paint: MPI No. 18.

## PART 3 - EXECUTION

### 3.1 ERECTION

- A. Erect structural steel according to AISC 303 and AISC 360.
- B. Set structural steel accurately at locations and elevations indicated on drawings.
- C. Maintain erection tolerances of structural steel within AISC 303 requirements.
  1. Pour Stop Elevation Tolerance: 6 mm (1/4 inch), maximum, before concrete placement.
- D. Weld and bolt connections as specified for shop connections.

SPEC WRITER NOTE: Retain field painting only when steel is shop primed or galvanized.

### 3.2 FIELD PAINTING

- A. After welding, clean and prime weld areas to match adjacent finish.
- B. Touch-up primer damaged by construction operations.
- C. Apply galvanizing repair paint to galvanized coatings damaged by construction operations.
- D. Finish Painting: As specified in Section 09 91 00, PAINTING.

**3.3 FIELD QUALITY CONTROL**

A. Record Survey:

1. Engage registered land surveyor or registered civil engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS to perform survey.
2. Measure and record structural steel framing plumbness, level, and alignment after completing bolting and welding and before installation of work supported by structural steel.
3. Identify deviations from allowable tolerances specified in AISC Manual.

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