

**SECTION 05 12 00
STRUCTURAL STEEL FRAMING**

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between // ---// if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.

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 WORK

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Special Inspections, Section 01 45 35
- C. Steel Joist: Section 05 21 00
- D. Steel Decking: Section 05 31 00
- E. Composite Steel Deck: Section 05 36 00
- F. Fireproofing: Section 07 81 00
- G. Painting: Section 09 91 00

SPEC WRITER NOTES:

1. AISC has a certification program in effect that confirms that a certified structural steel fabricating plant has the procedures and commitment to produce fabricated steel of the required quality for a given category of structural steel framing. Consider deleting the category certification if there is a minimal amount of steel on the job. Category CSE is for certified steel erectors. It applies to erectors of simple, conventional low-rise buildings. Category ACSE is for advanced certified steel erectors. It applies to erectors of large public and institutional buildings, buildings that are more complex, and high-rise steel-frame buildings. In addition to building complexity, this category applies to the repair and

rehabilitation of existing steel structures.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: AISC Quality Certification participant designated as AISC Certified Plant, Category BU.
 - 1. Regularly fabricates specified products.
 - 2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.
- B. Installer Qualifications: AISC Quality Certification Program participant designated as AISC-Certified Erector, Category //CSE// ACSE //.
 - 1. Regularly installs specified products.
 - 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
- C. The controlling contractor must ensure that the steel erector is provided written notification required by 29 CFR 1926.752, before authorizing the commencement of steel erection; provide copy of this notification to the RE/COR.
- D. Pre-Installation Conference: Convene a meeting on site, after submittals are received and approved but before any work, to review drawings and specifications, submittals, schedule, manufacturer instructions, site logistics and pertinent matters of coordination, temporary protection, governing regulations, tests and inspections; participants to include RE/COR and all parties whose work is affected or related to the work of this section.

1.6 REGULATORY REQUIREMENTS

- A. AISC: Specification for Structural Steel Buildings - Allowable Stress Design. // LRFD Specification for Structural Steel Buildings. //
- B. AISC: Code of Standard Practice for Steel Buildings and Bridges.

1.7 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIRMENTS, for project // local/regional materials, // low-emitting materials, // recycled content, // _____// requirements.

1.8 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Fabricator Qualifications

1.// Fabricator's Experience: Project Experience List: Provide contact names and addresses for completed projects. //

C. Installer Qualifications

1.// Installer's Experience: Project Experience List: Provide contact names and addresses for completed projects. //

B. Shop and Erection Drawings

C. Certificates:

1. Structural steel.
2. Steel for all connections.
3. Welding materials.
4. Shop coat primer paint.

D. Test Reports:

1. Welders' qualifying tests.

E. Design Calculations and Drawings:

1. Delegated Design Submittal: For structural-steel connections indicated on the construction drawings to comply with design loads, include analysis data // signed and sealed by the qualified professional engineer responsible for their preparation //.F.

Record Surveys.

1.9 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

SPEC WRITER NOTES:

1. Remove reference citations that do not remain in Part 2 or Part 3 of edited specification.
2. Verify and make dates indicated for remaining citations the most current at date of submittal; determine changes from date indicated on the TIL download of the section and modify requirements impacted by the changes.

B. American Institute of Steel Construction (AISC):

303-16 Code of Steel Buildings and Bridges
360-16 Specification for Structural Steel Buildings

D. American Society for Testing and Materials (ASTM):

A6/A6M-22 Standard Specification for General Requirements
for Rolled Structural Steel Bars, Plates,
Shapes, and Sheet Piling

A36/A36M-19	Standard Specification for Carbon Structural Steel
A53/A53M-22	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A123/A123M-17	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153/A153M-16a	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A242/A242M-18	Standard Specification for High-Strength Low-Alloy Structural Steel
A283/A283M-18	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
A500/A500M-18	Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A563-15	Standard Specification for Carbon and Alloy Steel Nuts
A572/A572M-18	Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
A780/A780M-20	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
A992/A992M-22	Standard Specification for Structural Steel Shapes
B695-21	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
F436/F436M-19	Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
F1554-20	Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
F2329/F2329M 15	Standard Specification for Zinc Coating, Hot Dip, Requirements for Application to Carbon and Alloy steel Bolts, Screws, washers, Nuts, and Special Threaded Fasteners.
F3125/F3125M-19	Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

E. American Welding Society (AWS):

D1.1/D1.1M-20 Structural Welding Code-Steel

Research Council on Structural Connections (RCSC):

Specification for Structural Joints Using High-Strength Bolts (2020)

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel: ASTM // A36, // A242, // A283, // A572, Grade ____ // A992 //.

B. Cold-Formed Structural Tubing: // ASTM A500, Grade B // ASTM A500, Grade C // ASTM A1085 //.

D. Steel Pipe: ASTM A53, Grade B.

E. Bolts, Nuts and Washers:

1. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

C. Anchor Rods: // ASTM F1554, Grade 36 // ASTM F1554, Grade 55, weldable //, straight.

1. Nuts: **ASTM A563 (ASTM A563M)** // heavy- // hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: **ASTM F436 (ASTM F436M)**, Type 1, hardened carbon steel.
4. Finish: // Plain // Hot-dip zinc coating, ASTM A153/A153M, Class C // Mechanically deposited zinc coating, ASTM B695, Class 50 //.

F. Zinc Coating: ASTM A123.

G. Galvanizing Repair Paint: ASTM A780/A780M.

2.2 Connection Design Information:

SPEC WRITER NOTES:

1. Retain one or more of first four subparagraphs below. If more than one subparagraph is applicable, distinguish connections that belong to each subparagraph on the Drawings. Connection design practices among structural engineers vary nationwide; subparagraphs below are alternatives recognized by ANSI/AISC 303.

A. Connection designs have been completed and connections indicated on the Drawings.

- B. Fabricator's experienced steel detailer selects or completes connections in accordance with ANSI/AISC 303.
 - a. Select and complete connections using // schematic details indicated and ANSI/AISC 360 // Insert source //.
 - b. Use // Load and Resistance Factor Design; data are given at factored-load level // Allowable Stress Design; data are given at service-load level //.
- C. Design connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer. Member reinforcement at connections is indicated on Drawings.
 - a. Use // Load and Resistance Factor Design; data are given at factored-load level // Allowable Stress Design; data are given at service-load level //.
- D. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.
 - a. Use // Load and Resistance Factor Design; data are given at factored-load level // Allowable Stress Design; data are given at service-load level //.

PART 3 - EXECUTION

3.1 CONNECTIONS (SHOP AND FIELD)

- A. Welding: Welding in accordance with AWS D1.1. Make welds 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.
- B. High-Strength Bolts: High-strength bolts tightened to a bolt tension not less than proof load given in Specification for Structural Joints. Perform tightening 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 or the turn-of-the-nut method. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

3.2 FABRICATION

- A. Execute fabrication in accordance with Chapter M, Specification for Steel Buildings - Allowable Stress Design and Plastic Design // Load and Resistance Factor Design. //

3.3 SHOP PAINTING

- A. General: Shop paint steel with primer in accordance with Section 6, Code of Standard Practice for Steel Buildings and Bridges.
- B. Shop paint for steel surfaces is specified in Section 09 91 00, PAINTING.
- C. Do not apply paint to following:
 - 1. Surfaces within 50 mm (2 inches) of joints to be welded in field.
 - 2. Surfaces which will be encased in concrete.
 - 3. Surfaces which will receive sprayed on fireproofing.
 - 4. Top flange of members which will have shear connector studs applied.
- D. Zinc Coated Finish (Hot Dip Galvanized): Provide per ASTM A123 (after fabrication).
- E. Bolts, Nuts, and Washers Galvanizing: ASTM F2329, hot dipped.
- E. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

3.4 ERECTION

- A. General: Erect structural steel framing in accordance with 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: 1/4 inch, maximum, before concrete placement.
- D. Weld and bolt connections as specified for shop connections.
- E. Splice members only where indicated.

3.5 FIELD PAINTING

- A. After erection, touch-up steel surfaces specified to be shop painted. After welding is completed, clean and prime areas not painted due to field welding.
- B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

3.6 RECORD SURVEY

- A. Upon completion of finish bolting or welding on any part of the work, and prior to start of work by other trades that may be supported, attached, or applied to the structural steel work, submit a certified

report of survey to RE/COR for approval. Prepare reports by Registered Land Surveyor or Registered Civil Engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS; specify that location of structural steel is acceptable for plumbness, level and alignment within specified tolerances.

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

Retain "Testing Agency" Paragraph below, with or without "Special Inspections" Paragraph above, to identify who performs tests and inspections. If retaining second option in "Testing Agency" Paragraph, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article.

B. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

RCSC prescribes inspection for snug-tightened joints and testing and inspection for each method of pretensioning joints.

1. Bolted Connections: Inspect[**and test**] bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

Retain first subparagraph below if required.

- a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

Retain applicable nondestructive testing methods in "Liquid Penetrant Inspection," "Magnetic Particle Inspection," "Ultrasonic Inspection," and "Radiographic Inspection" subparagraphs below. Revise to indicate extent of weld inspections if applicable and to insert

alternative acceptance criteria to
AWS D1.1/D1.1M if required.

- 1) Liquid Penetrant Inspection: ASTM E165/E165M.
 - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.
 - 5) Retain "Shear Stud Connectors" Subparagraph below if field-welded shear stud connectors are required.
3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

- a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

Revise subparagraph below if an actual
amount or percentage of shear connectors
requires testing.

- b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

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