



**SPECIAL PROVISIONS
FOR
STRUCTURAL STEEL FRAMING**

**Des Moines County
EDP-0977(653)--7Y-29**

**Effective Date
June 15, 2021**

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

155065.01 DESCRIPTION.

A. Summary.

1. Section Includes.

- a. Structural steel.
- b. Grout.

2. Related Requirements.

Special Provisions for Architecturally Exposed Structural Steel for fabrication and finishing requirements.

B. Definitions.

Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

C. Performance Requirements.

1. Connections.

- a. Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified Professional Engineer licensed in the State of Iowa, to withstand loads indicated and comply with other information and restrictions indicated.
- b. Select and complete connections using schematic details indicated and AISC 360.
- c. Use LRFD; data are given at factored level.

2. Moment Connections: Type FR, fully restrained.

3. Construction: Moment frame.

D. Action Submittals.

1. Product Data: For each type of product indicated.
2. Shop Drawings: Show fabrication of structural-steel components.
 - a. Prepare erection plans, complete with all necessary plans, elevations, and sections, to indicate size and relative position of members. Do not reproduce design plans for use as erection plans. Include erection plans with each submittal indicating marks of all members, assemblies and loose pieces included in the submittal.
 - b. Indicate on details of all pieces, principal column grid lines where members are located.
 - c. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - d. Include setting plans and direction for installation of anchor rods and other anchorages embedded in concrete.
 - e. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - f. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - g. Indicate surface preparation as per SSPC and prime painting for each member if specified.
 - h. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the licensed structural engineer responsible for their preparation.
 - i. Clearly indicate revisions made on erection plans and pieces on any re-submittal.
3. Calculation Requirements:
 - a. Submit typical connection calculations as specified.
 - b. For structural steel connections indicated to comply with design loads, include structural design data and calculations along with Shop Drawings, signed and sealed by the qualified professional engineer responsible for their preparation.
 - c. For calculations generated by computerized proprietary software, include sufficient design assumptions, input and output information to permit their proper evaluation. Submit a sample problem with manual calculations for each type of connection to illustrate details of computerized calculations, unless waived by the Engineer during connection review meeting.
4. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs):
 - a. Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including power source (constant current or constant voltage).
 - b. Electrode manufacturer and trade name, for demand critical welds.

E. Informational Submittals.

1. Qualification Data: For qualified Installer fabricator.
 - a. Welding certificates.
 - b. Mill test reports for structural steel, including chemical and physical properties.
 - c. Product Test Reports: For bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 1) Direct-tension indicators.
 - 2) Tension-control, high-strength bolt-nut-washer assemblies.
 - 3) Welding filler metals and fluxes.
 - 4) Nonshrink grout.
 - 5) Galvanizing.
2. Fastener Certification.

- a. Submit to the inspection and testing agency and the Engineer certified copies of mill test reports for the bolts, nuts and washers from the manufacturer for each shipping lot, complying with the requirements of ASTM A 325, ASTM A 563, ASTM F 436 and ASTM F 959.
- b. Submit to inspection and testing agency, a certified statement of compliance that high-strength bolts, nuts and washers furnished under this section meets the specified requirements.
- c. Submit to inspection and testing agency, a certified statement of compliance that welding materials furnished under this section meets AWS requirement.

F. Quality Assurance.

1. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
2. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
3. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1.
4. Comply with applicable provisions of the following specifications and documents:
 - a. AISC 303.
 - b. AISC 360.
 - c. AWS D1.1, with the exception as listed in AISC 360-05 specification section J2, apply in lieu of AWS provisions and to the following:
Delete section 5.3.3.4, "Recrushed Slag"
 - d. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
5. Preinstallation Conference: Conduct conference at Project site.

G. Delivery, Storage, and Handling.

1. 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 corrosion and deterioration.
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.
3. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
4. Fasteners may be repackaged provided Contracting Authority's testing and inspecting agency observes repackaging and seals containers.
 - a. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - b. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.
 - c. Do not store material on structure that might cause distortion, damage or overload to members or supporting structures. Repair or replace damaged materials or structures as directed by the Engineer.

H. Coordination.

1. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

2. Coordinate installation of 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.

I. Project Conditions.

Make such field measurements as are necessary to lay out the Work properly.

155065.02 MATERIALS.

A. Structural Steel.

1. W-Shapes: ASTM A 992.
2. Channels, Angles: ASTM A 36.
3. Plate and Bar: ASTM A 36, Plates and bars used for stiffeners and doubler shall be ASTM A 572, Grade 50.
4. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.
5. Welding Filler Materials, Fluxes and Electrodes: Comply with AWS requirements.

B. Bolts, Connectors, and Anchors.

1. Carbon Steel Bolts: ASTM A 307.
2. Zinc-Coated High-Strength Bolts, Nuts, and Washers:
 - a. ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - b. Finish: Hot-dip or mechanically deposited zinc coating.
3. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.
4. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies:
 - a. ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - b. Finish: Galvanized.
5. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
6. Nuts: ASTM A 563 heavy-hex carbon steel.
7. Plate Washers: ASTM A 36 carbon steel.
8. Washers:
 - a. ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - b. Finish: Hot-dip zinc coating, ASTM A 153, Class C.

C. Primer.

Galvanizing Repair Paint: ASTM A 780.

D. Grout.

Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30 minute working time. Grout shall attain 4000 psi compressive strength in 7 days and 8000 psi in 28 days.

E. Asphaltic Mastic.

Bituminous Asphaltic Coating: ANSI-21.4 and AWWA C104.

F. Fabrication.

1. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - a. Camber structural-steel members where indicated.
 - b. Fabricate beams with rolling camber up.
 - c. All provisions of AWS D1.1 apply to welds.
 - d. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - e. Mark and match-mark materials for field assembly.
 - f. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
2. Shop Welding: Perform welding in accordance with approved welding procedures and AWS D1.1, except as modified in Section J2 of AISC 360-05.
 - a. Enforce and supervise approved procedure for welding during fabrication of structural steel by employing experienced supervisors knowledgeable of good welding practices.
 - b. Assemble and weld built-up sections by method that will maintain true alignment of axes without exceeding tolerance of AISC 303-05.
 - c. Remove backing bars or run off tabs, back gouge, and grind smooth as per AWS D1.1 requirements.
 - d. Welding shall conform to the AESS specification requirements.
3. High Strength Steel Bolting.
 - a. Joints subjected to fatigue load with reversal of loading direction.
 - b. Joints installed in oversized holes.
 - c. Joints that utilize slotted hole except those with applied load normal to long dimension of the slot.
 - d. Joints in which slip at the faying surface would be detrimental to the performance of the structure.
 - e. Joints in which fastener pretension is required in the governing code or specification.
 - f. Joints subjected to load reversal.
 - g. Joints subjected to fatigue load with no reversal of loading.
 - h. Joints with ASTM A325 or F1852 bolts subjected to tensile fatigue.
 - i. Joints with ASTM (5) A490 bolts that are subjected to tension, or combined shear and tension, with or without fatigue.
4. ST joints are permitted for all other application and should be used whenever possible.
 - a. Mixing of A325 and A490 bolts of same diameter should be avoided to assure that bolts are installed in proper locations.
 - b. Do not use A490 bolts larger than 1 inch diameter in SC joint as torque required to install these is beyond the commonly available wrenches.
 - c. Coordinate and indicate on drawing joint types.
 - d. Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolts and type of joint as indicated.

- e. Snug tightened joints (ST): Bearing type connections based on allowable stresses with threads included in shear plane (Type N). Faying surfaces and surfaces adjacent to bolt heads and nuts shall be free of dirt and other foreign material.
 - f. Pretensioned joints (PT): Provide PT joints as indicated. Use turn-of Nut (nut rotation from snug-tight condition), calibrated wrench pretensioning, Tension-Control (twist-off) bolt assembly conforming to ASTM F1852, or Direct-Tension Indicator conforming to ASTM F959 as pretensioning method. Faying surfaces adjacent to bolt heads and nuts shall be free of dirt and other foreign material.
 - g. Slip-Critical Joints (SC): Provide SC joints as indicated using direct tension indicator conforming to ASTM F959 or Tension-Control (twist-off) bolt assembly conforming to ASTM F1852 and installed according to Section 8 of RSSC. Faying surfaces shall be free of burr, blast cleaned to comply with RCSC Class B requirement.
 - h. Columns and Base Plates: Furnish anchor rods (bolts) as indicated to be embedded in concrete, including nuts and washers. Detail anchor rods (bolts) such that the minimum projection above the nut, after the column is in place, is 1 inch.
 - i. Beams: Provide one-piece beams without splice(s), unless otherwise indicated. Where splices are permitted, splice connections shall develop the strength of the beam.
 - j. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - k. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
5. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
6. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
7. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning, SSPC-SP 2, "Hand Tool Cleaning or SSPC-SP 3, "Power Tool Cleaning."
8. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
9. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
- a. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - b. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - c. Weld threaded nuts to framing and other specialty items indicated to receive other work.
 - d. Hollow Structural Steel and Other Closed End Members.
 - e. Provide hollow structural steel and other closed end members with cap plates with watertight welds at the ends and with weep holes where indicated.
10. Connections for Other Work: Notify other trades so that holes in structural steel can be provided for attachments where required. Provide necessary holes if information is received prior to fabrication.

G. Shop Connections.

- 1. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified. Joint Type: Snug tightened Pretensioned Slip critical.
- 2. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

- a. Enforce and supervise approved procedure for welding during fabrication of structural steel by employing experienced supervisors knowledgeable of good welding practices.
- b. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
- c. Remove backing bars or run off tabs, back gouge and grind smooth as per AWS D1.1 requirements.

H. Galvanizing.

1. Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
2. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
3. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.
4. Safeguard against warpage and distortion during galvanizing in accordance with ASTM A384.
5. Where welding is required after galvanizing, conform to AWS D19.0 – Welding of Zinc Coated Steel. Perform welding in well-ventilated area.
6. On bolts, nuts, and washers: ASTM B695, Class 50.
7. Galvanizing Repair paint: ASTM A780.

I. Source Quality Control.

1. Testing Agency: Contracting Authority will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Correct deficiencies in Work that test reports and inspections indicate does not comply with the contract documents.
3. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
4. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
5. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 - a. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - b. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

155065.03 CONSTRUCTION.

A. Examination.

1. Verify, with steel Erector present, elevations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - a. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
 - b. Detail the structural steel with a minimum of 1 inch of anchor rod (bolt) thread projecting above the nuts and the base plate hole $1 \frac{1}{3}$ times the rod (bolt) diameter. Based on these procedures, the foundations shall be found acceptable if erection can be accomplished within AISC 303-05 tolerances for plumbness and elevation, and with minimum-maximum grout thickness of $\frac{1}{2}$ to 2 inches.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Preparation.

1. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
2. Design and provide temporary supports, such as guys, bracing, falsework, cribbing or other elements required for steel framework erection, including partly assembled steel framing in consideration of noted interaction items. Design temporary supports to withstand all loads to which the structure may be subjected during erection and subsequent construction, including erection equipment.
3. Furnish and place all temporary bracing necessary for erection before bolting or welding. Only light drifting will be permitted to draw parts together. Drifting to match unaligned holes will not be permitted. Perform enlargement of holes necessary to make connections resulting from misfit by drilling and reaming; then use the proper size bolt.

C. Erection.

1. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
2. Comply with OSHA 29 CFR 1926, and all state, city and municipal laws for steel erection.
3. Foundation and anchor rods (bolts) are designed for the forces of completed structure. Forces due to erection are the responsibility of the Contractor.
4. Start steel erection only after concrete in the supporting structure such as footings, piers and walls or mortar in masonry piers and walls has attained minimum 75% of intended strength or sufficient strength to support the loads imposed during steel erection.
5. In planning the method of erection, make full allowance for obstructions encountered which may result from work performed by other trades as well as the operations of the Contracting Authority.
6. In planning the method of plumbing the structure, make allowance for temperature difference between time of erection and mean operating temperature of structure when completed. Take into account differential temperature effects on column lengths in plumbing when tall frames are subjected to strong sun exposure on one side.

7. Furnish and deliver to the job site anchor rods (bolts), and templates for setting the anchor rods (bolts).
 - a. Lateral-load-resisting system and connecting diaphragm that provides lateral strength and stability in completed structure.
 - b. Any special erection considerations that are required by design such as shores, jacks or load that must be adjusted during erection, etc.
8. All lateral load resistance and stability of the completed structure in each orthogonal direction is provided by braced frames, and connection diaphragm elements of beams, steel roof deck and fastening, steel floor deck, fastening and concrete.
9. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - a. Set plates for structural members on wedges, shims, or setting nuts as required.
 - b. Weld plate washers to top of baseplate.
 - c. 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 plate before packing with grout.
 - d. Promptly pack grout solidly between bearing surfaces and 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.
10. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
11. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
12. Level and plumb individual members of structure.
13. Splice members only where indicated.
14. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.
15. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
16. Coat base of column and base plate below grade with Bituminous Asphaltic Coating.

D. Field Connections.

1. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - a. Joint Type: Snug tightened Pretensioned Slip critical.
 - b. Provide a minimum of two rows of bolts for beam connections. Begin connection near top of the web and extend them down to at least one half of distance between web toes of fillet at top and bottom of web.
 - c. Provide truss connections to column with symmetrical double angles and bolts designed for eccentricity and prying action. Provide minimum of six high strength bolts for truss to truss or truss to column connection.
 - d. ASTM A 307 bolts may be used for secondary members such as girts, door frames, parapet frames, small roof openings (less than 2 feet 0 inches square) and sag rods.

2. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - a. Field welding will be permitted only where indicated on approved Shop Drawings or where otherwise approved by the Engineer. Perform field welding in accordance with the approved welding procedures and AWS D1.1 except as modified in Section J2 of AISC 360-05.
 - b. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - c. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - d. Remove backing bars or runoff tabs, back gouge and grind smooth as per AWS D1.1 requirements.
 - e. Welding shall conform to the AESS specification requirements.

E. Field Quality Control.

1. Testing Agency: Contracting Authority will engage a qualified independent testing and inspecting agency to inspect field welds high-strength bolted connections.
2. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
3. Welded Connections: Field welds will be visually inspected according to AWS D1.1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
4. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 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.
 - b. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
5. Correct deficiencies in Work that test reports and inspections indicate does not comply with the contract documents.

F. Repairs and Protection.

Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

155065.04 METHOD OF MEASUREMENT.

Structural Steel Framing will not be measured for payment.

155065.05 BASIS OF PAYMENT.

Payment for this item will be incidental to line item Shade Structure.