

SECTION 05120

STRUCTURAL STEEL FRAMING

PART I GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Structural steel.
 - 2. Prefabricated building columns.
 - 3. Grout.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components. Furnish shop drawings for approval. Fabrication before approval of shop drawings will be at Contractor's risk.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. 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.
 - 4. Indicate type, size and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. Identify demand critical welds.
- C. Qualification Data: For qualified testing agency.
- D. Welding Certificates, if requested by the Architect/Engineer.
- E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- F. Mill test reports for structural steel, including chemical and physical properties, if requested by the Architect/Engineer.
- G. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Non-shrink grout.

1.5 QUALITY ASSURANCE

- A. The following codes and publications, of the latest edition, govern this work unless indicated or specified otherwise.
 - 1. American Institute of Steel Construction (AISC): Comply with the following, except when modified herein:
 - a. Code of Standard Practice for Steel Buildings and Bridges.
 - b. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
 - c. Specification for Structural Joints using ASTM A325 or A490 Bolts.
 - 2. American Welding Society (AWS); Comply with the following, except when modified herein:
 - a. AWS D1.1, Structural Welding Code.
 - 3. Steel Structures Painting Council (SSPC): Comply with the following, except when modified herein:
 - a. Surface Preparation Specifications. (References appear as the specification number preceded by the initials SSPC).
 - 4. American Society for Testing and Materials (ASTM): Comply with the ASTM standards herein.
- B. Certification of Welders: Welding of all structural steel shall be limited to welding operators whose competency has been tested in accordance with the Structural Welding Code of AWS.
- C. Testing: An independent testing laboratory shall be employed by the Contractor to certify that all fasteners and welds are installed in accordance with the drawing specifications. Upon completion of inspection and testing, submit two (2) copies of all reports to the Architect/Engineer. Bolted connections shall be tested in accordance with AISC specifications. Perform visual inspection of all welds.
- D. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated.

1.6 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 corrosion and deterioration.
 - 1. 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.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and re lubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

1.7 COORDINATION

- A. 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.
- B. 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.

PART 2 PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992; ASTM A572, Grade 50.
- B. Channels, Angles: ASTM A36; ASTM A572, Grade 50.
- C. Plate and Bar: ASTM A36; ASTM A572, Grade 50.
- D. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B structural tubing (Fb=46ksi).
- E. Steel Pipe: ASTM A53, Type E or S, Grade B.
 - 1. Weight Class: Standard, unless otherwise noted.
 - 2. Finish: Black, except where indicated to be galvanized.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS AND ANCHORS

- A. High-Strength Bolts, Nuts and Washers: ASTM A325, Type 1.
 - 1. Direct-Tension Indicators: ASTM F959, Type 325 (ASTM F959M, Type 8.8), compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts and Washers: ASTM A490 (ASTM A490M), Type 1, heavy-hex steel structural bolts.
 - 1. Direct-Tension Indicators: ASTM F959, Type 490, compressible-washer type with plain finish.
- C. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- D. Headed Anchor Rods: ASTM F1554, Grade 36, (ASTM F1554, Grade 55, weldable); ASTM A354; ASTM A448, straight.
 - 1. Nuts: ASTM A563 hex carbon steel.
 - 2. Plate Washers: ASTM A36 carbon steel.
 - 3. Washers: ASTM F436, Type 1, hardened carbon steel.
 - 4. Finish: Hot-dip zinc coating, ASTM A153, Class C.
- E. Threaded Rods: ASTM A36; A572, Grade 50.
 - 1. Nuts: ASTM A563 heavy hex carbon steel.
 - 2. Washers: ASTM A36, carbon steel.
 - 3. Finish: Hot-dip zinc coating, ASTM A153, Class C.

2.3 PRIMER

- A. Primer: Comply with Division 09 Painting Sections.
- B. Primer: SSPC-Paint Specification No.2; minimum thickness of coat shall be 2.0 mil., dry film thickness.
- C. Galvanizing Repair Paint: MPI#18, MPI#19 or SSPC Paint 20.

2.4 GROUT

- A. Non-metallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate

grout, non corrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. 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.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural steel assemblies, including welding of units, before starting shop priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC SP3, "Power Tool Cleaning".
- F. 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.

2.6 SHOP CONNECTIONS

- A. 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.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP3, "Power Tool Cleaning".

- C. Painting: Prepare steel and apply a one-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 2.0 mils, using SSPC-Paint No.2.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dipped process to structural steel according to ASTM A123, A153 or A386, as applicable.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
- D. Welded Connections: Perform visual inspections of shop-welded connections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. 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.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims or setting nuts, as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. 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.
 - 4. 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.

- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges".
- D. 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.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. 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.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections 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 in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor will engage a qualified independent testing and inspecting agency to inspect field welds, and high-strength bolted connections. The testing agency will be acceptable to the Architect/Engineer.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA1 for

touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP2 hand tool cleaning or SSPC-SP3 power tool cleaning.

C. Touch-up Painting: Cleaning and touch-up painting are specified in Division 09 painting Sections.

END OF SECTION 05120