

**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

- A. The drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Features:
1. Structural steel fabrication and erection required for completion of the work.
  2. Architectural exposed structural steel fabrication and erection required for completion of the work, where indicated.
- B. Related Sections:
1. 01 33 00 – Submittal Procedures
  2. 01 45 00 – Structural Testing, Inspection, and Quality Assurance
  3. Division 1 Section “Sustainable Design Requirements” for all materials
  4. 05 31 00 – Steel Decking
  5. 07 81 00 – Applied Fireproofing

**1.3 REFERENCE STANDARDS**

- A. General: Comply with the provisions of the latest versions of the publications listed below except as otherwise shown or specified.
- B. American Institute of Steel Construction (AISC):
1. AISC Steel Construction Manual
  2. AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts
  3. AISC 303 Code of Standard Practice for Steel Buildings and Bridges, as modified herein
  4. AISC 341 Seismic Provisions for Structural Steel Buildings.
  5. AISC 360 Specifications for Structural Steel Buildings
- C. American Society for Testing and Materials (ASTM):
1. ASTM A6 General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
  2. ASTM A36 Structural Steel
  3. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  4. ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip
  5. ASTM A307 Carbon Steel Externally and Internally Threaded Standard Fasteners
  6. ASTM A325 High-Strength Bolts for Structural Steel Joints
  7. ASTM A441 High-Strength, Low-Alloy Structural Manganese-Vanadium Steel
  8. ASTM A490 Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints
  9. ASTM A500 Grade B Cold-Formed Welded and Seamless Carbon Steel Structural Tubing
  10. ASTM A501 Hot-Formed Welded and Seamless Carbon Steel Structural Pipe
  11. ASTM A572 High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality
  12. ASTM A588 High-Strength Low-Alloy Structural Steel with 50,000 PSI Minimum Yield Point to 4-Inch Thickness
  13. ASTM A913 High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by the Quenching and Self-Tempering Process (QST)
  14. ASTM A992 Standard Specifications for Steel for Structural Shapes for Use in Building Framing
  15. ASTM F959 Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners
  16. ASTM F1852 Standard Specifications for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies

- D. American Welding Society (AWS):
1. AWS A2.4 Welding Symbols
  2. AWS A3.0 Terms and Definitions
  3. AWS A5.1 Specifications for Mild Steel Covered Arc Welding Electrodes
  4. AWS A5.5 Specification for Low-alloy Steel Covered Arc Welding Electrodes
  5. AWS A5.17 Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding
  6. AWS A5.20 Specification for Carbon Steel Electrodes for Flux Cored Arc Welding
  7. AWS A5.23 Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding
  8. AWS D1.1 Structural Welding Code - Steel
  9. AWS D1.4 Reinforcing Steel Welding Code, including Metal Inserts and Connections in Reinforced Concrete
  10. AWS D1.8 Structural Welding Code - Seismic Supplement

#### 1.4 STRUCTURAL DRAWINGS

- A. The Contract Documents are complementary. The Structural Drawings shall not be considered a stand-alone document. The Contractor shall use the Structural Drawings in conjunction with all of the Contract Documents, including but not limited to the Architectural, Civil, Mechanical, and Electrical Drawings. Locations of steel members not provided in the Structural Drawings shall be determined from these other Drawings.
- B. Delete Sections 2.1 and 2.2 from AISC 303 and replace with the following:
- 2.1 Definition of Structural Steel  
Structural Steel shall consist of the elements of the structural frame that are shown and sized in the structural Design Drawings.
- 2.2 Other Steel, Iron, or Metal Items  
Structural Steel shall not include other steel, iron, or metal items that are not shown and sized in the structural Design Drawings.

#### 1.5 QUALITY ASSURANCE

- A. Fabricator/Erector: Must have plant, facilities, and personnel sufficient to fabricate and/or erect structural steel indicated on the drawings. Must have minimum of 5 years experience with a record of successful in-service performance and be able, upon request, to show framing of size, materials, and scope similar to work of this contract. Must demonstrate sufficient production capacity to provide structural steel indicated on the drawings.
- B. Material: Provide only structural steel certified as conforming with specified requirements and fabricate specifically to the requirements of this contract. Material that does not conform to the requirements of this contract may be rejected at any time.
- C. Charpy V-Notch Testing: Testing shall be in accordance with ASTM A6, Supplement S30, where this testing is specifically required.
- D. Allowable Tolerances: Unless otherwise specified or noted on drawings or in this specification, provide structural steel work in accordance with the following minimum tolerances:
1. Fabrication Tolerances: In accordance with requirements of AISC specification unless noted otherwise and as required to maintain the erection tolerances specified herein.
  2. Erection Tolerances: In accordance with requirements of AISC. The Contractor alone shall be responsible for the correct fitting of all structural members and for the elevation and alignment of the finished structure. Any adjustment necessary in the steel frame because of discrepancies in elevations and alignment shall be the responsibility of the Contractor.
- E. Connection Identification: Each person installing connections shall be assigned an identifying symbol or mark, and all shop and field connections shall be so identified so that the Owner's Testing Agency can refer to the person making the connection.

- F. Test and Inspections: Work is subject to special testing and inspection. Refer to Section 01 45 00, "Structural Testing, Inspection, and Quality Assurance." The Fabricator/Erector shall provide the Owner's Testing Agency and the Architect/Engineer access to places where material is being fabricated/erected. Notice shall be given for joints requiring inspection for proper end preparation, root opening, etc., prior to welding.
- G. Engineering by Contractor: The Contractor shall engage a structural or civil engineer, licensed in the state where the project exists, to review and design, where needed, for the support of hoisting equipment, welding machines, and other construction imposed loads, for the stacking of materials such as steel decking, etc., and for temporary bracing, shoring, and other safety related construction procedures where required. It is the Contractor's responsibility to obtain and pay for such engineering services.
- H. Welder Qualifications: Each welder performing work on this project shall be qualified before commencement of welding on this project in accordance with the American Welding Society, AWS D1.1. Copies of each welder's qualification records shall be made available to the Architect and Owner's Testing Agency for review.
- I. Inspections: A qualified inspector under the requirements of the building code shall continuously inspect field welds.
- J. Bolting Quality Assurance: The bolt supplier shall visit the project site or fabrication plant if bolt installation is to be performed during the bolting start-up to demonstrate proper installation procedures and verify inspection procedure with the Contractor, Erector, and the Owner's Testing Agency. The Contractor shall distribute written verification of the visit to the attending parties, Owner, Architect, and Owner's Structural Engineer.
- K. Shop Testing by Contractor: The Contractor shall perform ultrasonic testing and visual inspection of all plate material and rolled sections greater than 1-1/2 inches in thickness and located at welded connections for discontinuities prior to fabrication. The test area is defined as a zone up to 6 inches away from the weld in the connection. These tests shall be in addition to the ultrasonic testing of all complete joint penetration welds that will be performed by the Owner's Testing Agency. The Contractor's testing shall be submitted to the Architect/Engineer and Owner's Testing Agency. All costs associated with this testing shall be borne by the Contractor.
1. Ultrasonic Testing: Conduct in accordance with ASTM A435 with the following modifications and supplementary requirements:
    - a. Supplementary Requirements S1, requiring 100% scanning of the test, are to be included.
    - b. Section 5.2, Acceptance Standards, is supplemented with the following provision: "The fabricator, insofar as practical, may reposition a rejected plate so that rejectable defects are not located in a test area."
- L. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- M. Pre-Construction Conference: Schedule a job conference to review the Structural Documents prior to development of shop drawings. The conference shall be attended by all pertinent parties, which is, at a minimum, to include the Fabricator, Erector, Contractor, Owner's Testing Agency, and Structural Engineer.

## 1.6 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00, "Submittal Procedures."
- B. LEED Submittals:
1. MR4.1 and 4.2 – List of Proposed materials with recycled content: Indicate projected materials cost, projected post-industrial (pre-consumer) recycled content, and projected post-consumer recycled content for each product projected to have recycled content.
  2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

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- C. Shop Drawings: Submit shop drawings for review prior to commencing any fabrication of structural steel.
1. Show framing layout, dimensions, connections with adjoining materials and construction, finishes, welds, bolts and fasteners, anchoring, and all fabrication or erection accessories required.
  2. Specify field welds, cuts, holes, and fasteners.
  3. Verify all dimensions and correlate with adjoining construction and materials.
  4. Indicate size, type, and grade of all members.
  5. Include with each detail shown on the shop drawings a reference to the Architect's and Engineer's drawings and details, where applicable.
  6. Prior to shop drawing submittal, the Contractor and Fabricator shall review the drawings for obvious drafting and detailing errors.
- D. One month prior to commencing fabrication, submit Fabricator's quality assurance procedures to the Architect, Engineer, Owner, and Owner's Testing Agency.
- E. Indicate welded connections on shop drawings using standard AWS welding symbols. Show all welded connections with details showing size, length, location, and type of welds.
- F. Mill Reports: Submit three copies of certified mill reports indicating heat and melt numbers of steel. Mill reports are to be submitted for record only and will not be reviewed:
1. If test reports are not submitted or test reports cannot be identified with material proposed for use in the work, then secure and perform structural tests on 5% of all such unidentified steel.
  2. Contractor shall furnish all such material for testing and pay for all such tests.
  3. Furnish Owner, Architect, and Structural Engineer certified copies and Fabricator one certified copy of all test reports.
- G. Inspection Test Reports: Upon request, submit to Architect copies of Contractor's ultrasonic testing reports.
- H. Placement Plans: Submit placement plans and details as required for the satisfactory placing, connection, and anchorage of all structural members.
- I. Survey Reports: Promptly submit an accurate survey of actual elevations and locations of base plates and anchor bolts, and alignments as well as elevations of all steel as noted on the drawings. The report shall specify that the location of the structural steel is acceptable for plumbness, level, and alignment within the specified tolerances.
- J. Certification: Submit manufacturer's certified test reports on load indicator washers and/or tension control bolts on at least three samples from each heat supplied to conform to tolerance range.
- K. Welding Procedures: For welded joints prequalified and non-prequalified by AWS D1.1, submit a description of welding procedures proposed for use on structural steel a minimum of one month prior to use. Furnish joint welding procedure qualification tests as required by AWS D1.1 for non-prequalified welded joints. Welding procedures shall be reviewed by the Owner's Testing Agency, and an approved copy shall be forwarded to the Structural Engineer.
- L. Manufacturer's Certification is required as follows:
1. Bolts, Nuts and Washers: Furnish complete manufacturer's mill test reports conforming to ASTM A325, Type 1, or ASTM A490. Markings and chemistry must also comply with the specification. Certification numbers must appear on product containers and correspond to certification numbers on mill test report to be accepted. Mill test report must be supplied to both purchaser and Owner's Testing Agency.
  2. Filler material for welding.
- M. Erection Plan: Submit a comprehensive erection plan including sequencing, crane requirements, means and methods, temporary shoring and bracing, safety procedures, etc. The erection design and calculations shall be prepared by a structural engineer, licensed in the state of the project. The erection plan is to be submitted solely for the purpose of confirming that the Contractor has complied with the specification requirements to prepare an erection plan. The erection plan will not be reviewed.
- N. Product Data: For shop primers, include manufacturer's technical information including basic materials analysis and application instructions.

- O. Structural Calculations: Submit structural calculations for connections that are designed by the Contractor as required in the construction documents. These calculations shall be prepared by a qualified licensed professional engineer registered in the state where the project is located.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the requirements of the general conditions and of ASTM A6, including the following.
- B. Store materials in a manner to permit easy access for inspection and identification.
  - 1. Keep steel members off the ground, using pallets, platforms, or other supports.
  - 2. Protect steel members and packaged materials from corrosion and deterioration.
- C. Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures. Repair or replace damaged materials or structures at no additional cost to the Owner.
- D. Columns, beams, girders, and other members that are to receive sprayed-on fireproofing shall be free of loose rust, heavy mill scale, oil, dirt, or other foreign substances prior to application of fireproofing materials.
- E. All fasteners shall be stored and protected in accordance with the current requirements of the "Specification for Structural Joints using ASTM A325 or A490 Bolts."

### 1.8 JOB CONDITIONS

- A. Temporary Bracing: Temporary bracing and guylines shall be provided to adequately protect all persons and property and to ensure proper alignment.
- B. Temporary Floors: All temporary flooring, planking, and scaffolding necessary in connection with the erection of the structural steel or support of erection machinery shall be provided. The temporary floors or use of steel decking shall be as required by law and governing safety regulations. The reduced load capacity of members and assembly, especially the floor and roof beams and girders due to their unbraced condition prior to welding of steel deck and completion of concrete slabs, is hereby noted and shall be considered.
- C. Holding and Protection: In assembling and during welding, the component parts shall be held with sufficient clamps or other adequate means to keep parts straight and in close contact. In welding, precautions shall be taken to minimize "lock-up" stress and distortion due to heat. In windy conditions, welding shall be done only after adequate wind protection is furnished and set up and as specified in the AWS.

### 1.9 CONDITION OF STEEL

- A. Pre-Fireproofing Inspection: The Contractor, structural steel erector, sprayed-on fireproofing applicator, and the Owner's Testing Agency shall conduct a visual inspection of all structural steel prior to receiving fireproofing. The purpose of this inspection is to check for foreign substances on the surfaces, which could impair adhesion. Any cleaning that may be necessary as a result of this inspection shall be done at no additional cost to the Owner.
- B. Application of the sprayed-on fireproofing will not commence until all steel surfaces have been accepted by the sprayed-on fireproofing subcontractor and material manufacturer. No additional compensation shall be granted to the Contractor, structural steel erector, or fireproofing applicator should it be determined at a later date that foreign substances, which were allowed to remain on the steel surfaces, will have a detrimental effect in obtaining total adhesion in accordance with specification Section 07 81 00, "Applied Fireproofing."

### 1.10 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

- A. Where items are indicated on the drawings as being AESS, the fabrication, erection, and finishing of these items shall be in conformance with the AISC Code of Standard Practice for Steel Building and Bridges, Section 10.

**PART 2 PRODUCTS****2.1 MATERIALS AND COMPONENTS**

- A. Carbon Steel and High-Strength Low-Alloy Steel: Provide steel shapes, plates, and bars of structural quality, sizes, and standards noted on drawings for use in welded and bolted construction. Steel manufactured by the acid bessemer process shall not be used for structural purposes. Steel that, in the opinion of the Owner's Testing Agency, is badly corroded or physically damaged shall not be incorporated in the work until the Owner's representatives, Contractor, Erector, and Fabricator have agreed to allow the installation.
- B. Primer: Fabricators standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer.
1. Weldable primers shall not be used.
  2. Where other coatings (intumescent paint, architectural paint, etc.) are to be applied, use the appropriate primer as required per the architectural coatings specifications and as required to be compatible with these other coatings.
- C. Standard Fasteners: Low-carbon steel externally and internally threaded fasteners conforming to requirements of ASTM A307, Grade A. Provide hexagonal heads and nuts for all connections. Include lock washers under nuts or self-locking nuts.
- D. High-Strength Fasteners: Quenched and tempered steel bolts and nuts conforming to requirements of ASTM A325 or ASTM A490.
1. Provide heavy hexagonal head bolts and nuts, and hardened steel washers.
  2. Load indicator washers conforming to ASTM F959 or tension control bolts conforming to ASTM F1852 shall be used.
  3. Any proposed substitutions must have documentation submitted for review and approval of the Structural Engineer one month prior to construction.
  4. Acceptable tension control bolt suppliers shall be Lejuene Bolt Company/Lakeview, Minnesota, and Bristol Industries/Brea, California, or approved equal.
- E. Weld Electrodes: See AWS D1.1 and AWS D1.8 for requirements. See Structural General Notes for filler metal Charpy V-notch impact toughness requirements.
- F. Headed Shear Connector Studs, Deformed Bar Anchors: Refer to Section 05 31 00, "Steel Decking," for specific requirements at composite floor deck.
1. Headed Shear Connector Studs: Shall be Type B in accordance with AWS D1.1 and comply with ASTM A108, Grade 1015 or 1020; of dimensions complying with AISC specifications and the contract drawings; through deck stud welded shear connectors. Install in such a manner as to provide complete fusion between the end of the stud and structural steel base material.
  2. Deformed Bar Anchors: ASTM A496 of dimensions per plan. Install in such a manner as to provide complete fusion between anchor and base material.
  3. All steel stud/anchors welded to steel beams or plates shall be "Tru-weld studs," Division of Tru-Fit Screw Products Corporation, Cleveland, Ohio; "Nelson Stud," Division of Gregory Industries, Inc., Lorain, Ohio; or approved equal. All stud anchors shall be automatically end-welded in shop or field with equipment recommended by manufacturer of studs and anchors.
  4. All welded connectors are to be end welded in accordance with AWS D1.1. Base metal is to be clean, dry, and free of paint, rust, oil, scale, or other contaminants. Welding should not be done when the base metal temperature is below 0°F.
  5. Where threaded studs are specified, the stud shall utilize a reduced weld base so that the weld flash will match the diameter of the fastener.
- G. Drilled-in-Concrete Anchors: Refer to structural drawings.
- H. Slab Edge/Deck Supports: Refer to Section 05 31 00, "Steel Decking," for specific requirements at composite floor deck.
1. Provide additional structural steel support framing for steel deck where normal deck bearing is precluded by column flange plates or other framing members.
  2. The Contractor shall make specific provisions to provide the necessary framing materials at slab and roof edge conditions. The Contractor shall provide and install all gage metal edge closures where required by the plans and specification and shall coordinate shoring requirements at composite slab edges. The Contractor shall provide and install all structural steel bent plate edge closures or

structural steel edge materials and any corresponding bracing or shoring where required by the plans and specifications.

- I. Grout: Refer to Structural General Notes.
- J. Other Materials: Provide all incidental and accessory materials, tools, methods, and equipment required for fabrication and erection of structural steel framing as indicated on drawings. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
- K. General: Miscellaneous materials or accessories not listed above shall be provided as specified herein under the various items of work and as indicated on the drawings or required for good construction practice.
- \* L. Recycled Content: Materials shall contain post-industrial (pre-consumer) recycled content and/or post-consumer recycled content. Contractor shall document the cost and percentage (by weight) of each material broken out by post-industrial (pre-consumer) and post-consumer recycled content.
- \* M. Regional Content: Materials shall contain content that is extracted, harvested, recovered, or manufactured within 500 miles of the project site. Contractor shall document the cost and percentage (by weight) of each material that is regional.
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## 2.2 FABRICATION

- A. Fabricate all steel in accordance with requirements of AISC specifications and in accordance with details indicated on the drawings or as approved on shop drawings.
  - 1. Identify all steel at mill showing ASTM standard grade.
  - 2. Identify each piece with an erection mark corresponding to identifications noted on erection drawings.
- B. Materials shall be properly identified with an erection mark corresponding to identifications noted on erection drawings and match-marked where field assembly requires. The sequence of shipments shall be such as to expedite erection and minimize the field handling of material.
- C. Cutting: All holes and openings must be approved by the Owner's Structural Engineer.
  - 1. Do no flame cutting by hand of openings greater than 1/2 the depth of the member, unless approved by the Engineer.
  - 2. All flame-cut holes shall be smoothed by chipping, planing, or grinding members to required AISC tolerances.
  - 3. Sharp bends or kinks will not be allowed.
  - 4. Flame cutting by hand will not be allowed for holes at connections.
- D. Milled Surfaces: All milled surfaces shall be completely assembled or welded before milling. Milled surfaces are to provide full contact bearing for the entire cross section.
- E. Beams, girders, and trusses shall be upward cambered where indicated on the drawings. For beams, girders, and trusses without specified cambers, fabricate members so that after erection, any minor camber due to rolling or fabrication is upward.
- F. Connections Designed on the Structural Drawings:
  - 1. The Contractor shall not deviate from these designs unless approved by the Architect and Engineer.
  - 2. Connections shown on the drawings may eliminate certain methods of erection.
  - 3. If the Contractor elects a method of erection that requires a change of some of the connections, it must be approved by the Architect and Engineer.
- G. Combination of bolts and welds shall not be used for stress transmission in the same faying face of any connection without prior approval by the Structural Engineer.
- H. For stud anchor and deformed bar anchor welding, the area where the anchor is to be attached shall be made free of all foreign material such as rust, oil, grease, paint, galvanizing, etc.
  - 1. When the mill scale is sufficiently thick to cause difficulty in obtaining proper welds, it shall be removed by grinding or sandblasting.

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2. Use automatic end welding of headed stud shear connections in accordance with manufacturer's printed instructions.
- I. Welding processes other than shielded metal arc, flux core arc, and submerged arc may be used, provided procedure qualification tests in accordance with the American Welding Society are made for the intended application of all such processes.
  - J. Built-up sections assembled by welding shall be free of warpage, and all faces shall have true alignment.
  - K. Types of Welds: Required weld types are indicated by symbols on drawings; characteristics of welds shall be in accordance with standard specifications or codes as applicable; each welder shall mark his identification symbol on his work.
  - L. Preparation of Steel Surfaces to be Welded: Prepare edges to be joined by welding as indicated on drawings and in accordance with AWS D1.1. All welds are to be made to clean steel. Remove all coatings, galvanizing, grease, scale, rust, and other foreign matter at locations that are to be welded in accordance with AWS D1.1.
  - M. Reinforcing Steel: Welding or tack welding of reinforcing bars to other bars or plates, angles, and similar shapes is prohibited, except where specifically shown on plans or approved by the Structural Engineer; where required, use electrodes in accordance with requirements of AWS D1.4/12.1 and the Structural General Notes.
  - N. The toughness and notch sensitivity of the steel shall be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.
  - O. Detailing of connections, welding sequences, and preheat methods shall be such as to minimize restraint and the accumulation and concentration of through thickness strains due to weld shrinkage.
  - P. At welded joints that are not hidden by architectural finish materials, remove projecting ends of runoff tabs, backer bars, and any other erection aids, and grind flush with edges of plates.
  - Q. Cleaning of Steel Surfaces: Clean all surfaces of oil, grease, loose rust, loose mill scale, and other foreign matter present in sufficient quantities to impair bond of spray fireproofing or other specified coatings.
  - R. Steel Stud and Deformed Bar Anchors:
    1. All anchors shall be automatically end-welded in the shop or field with equipment recommended by the manufacturer of the studs and by qualified welders. Steel stud material, welding, and inspection shall be in accordance with AWS D1.1. End-weld in such a manner as to provide complete fusion between the end of the stud and the plate. There shall be no porosity or evidence of lack of fusion between the welded end of the stud and the plate.
    2. Tests and Inspections by the Contractor: Provide testing of deformed bar anchors and studs in accordance with AWS D1.1.
    3. Refer to Section 05 31 00, "Steel Decking," for specific requirements at composite floor deck.
  - S. Shop Priming:
    1. Shop prime steel surfaces except the following:
      - a. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
      - b. Surfaces to be high-strength bolted with slip-critical connections.
      - c. Surfaces to be welded.
      - d. Surfaces to receive sprayed-on fireproofing.
    2. Surface Preparation: Clean surfaces to be primed. Remove loose rust, loose mill scale, and splatter, slag, or flux deposits. Prepare surfaces to SSPC specification as follows:
      - a. SSPC-SP3 "Power Tool Cleaning".
    3. Priming: Immediately after surface preparation, apply primer according to the manufacturer's instruction and at the rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
      - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.



- b. Apply two coats of paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

### **PART 3 EXECUTION**

#### **3.1 SURFACE CONDITIONS**

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

#### **3.2 ERECTION**

- A. General: Erect structural steel framing in accordance with governing codes and specifications. Conform to configurations and connections as shown in the documents.
- B. Bracing: Provide temporary shoring and bracing members as required and according to the AISC Code of Standard Practice.
- C. Column Base and Bearing Plates: Align attached column bases and bearing plates for beams and similar structural members. Set loose column bases and bearing plates. Grout solid with non-shrink grout as specified.
- D. Field Assembly: Accurately assemble structural framing to lines and elevations indicated within specified or noted tolerances.
  1. Align and adjust various members of framing system prior to fastening.
  2. Prior to assembly, clean bearing surfaces and surfaces that will be in permanent contact.
  3. Splice structural members only where indicated or where approved.
  4. Cut holes by drilling only.
  5. Fasten splices of compression members after bringing abutting surfaces completely into contact.
  6. Make all field connections by high-strength bolting or welding, unless otherwise noted.
  7. Unless noted otherwise, tighten and leave erection bolts in place after welding. Where high-strength bolts are required, provide identified and marked bolts.
  8. Do not field cut or alter structural members without the written approval of the Structural Engineer.
  9. Do not use gas-cutting torches for correcting fabrication errors in structural framing.
  10. Finish gas-cut sections equal to a sheared appearance.
- E. Furnish shim plates or develop fills where required to obtain proper fit and alignment.
- F. Non-Fusible Backing Materials: The use of non-fusible backing materials, including ceramic and copper, in accordance with the structural notes, is permitted only with satisfactory welder qualification testing performed using the type of backing proposed for use, using the test plate shown in AWS D1.1, Figure 4.21, except that groove dimensions shall be as provided in the weld procedure specification. Welders using these backings shall be prequalified per AWS.
- G. Composite Construction: This building utilizes composite (concrete and structural steel) construction for various beams and columns. Careful sequencing of steel erection and concrete placement is recommended.
- H. Connections: No welding or bolting shall be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.
- I. Drift pins shall not be used to enlarge unfair holes in main material. Holes that must be enlarged shall be reamed up to a maximum of 1/16 inch larger to admit bolts. Burning, drifting, and reaming may be used to align unfair holes in members only after approval by the Owner's Structural Engineer.
- J. Mutilate threads or use lock nuts for unfinished bolts to prevent nuts from backing off. Draw unfinished bolt heads and nuts tight against the work.

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- K. Establish required leveling and plumbing measurements on the mean operating temperature of the structure of 65°F unless noted otherwise. Make allowances for differences between temperature at time of erection and mean temperature at which the structure will be maintained when completed and in service.
  - L. The steel erector shall leave the steel clean of oil or other contaminants as outlined under Part 2 of this Specification.
  - M. Touch-up Priming: Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop primer. Apply primer to exposed area with the same material as used for shop priming. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

### 3.3 ERECTION TOLERANCES AND SURVEY

- A. Plumb, level, and align individual pieces in accordance with the requirements of the "AISC Code of Standard Practice for Steel Buildings and Bridges."
- B. Field Survey: Make an accurate survey of alignments and elevations of all steel members as noted on the drawings.
  - 1. During construction of the steel frame, the Contractor shall survey the column locations and splice elevations as each column tier is erected. Submit survey reports indicating this information within 24 hours for review prior to erecting the subsequent tiers.
  - 2. Permanent benchmarks shall be established by a registered professional engineer employed by the Contractor in accordance with the requirements of contract documents.
  - 3. Should locations vary beyond the allowable tolerances, notify the Architect/Engineer and take necessary corrective measures and modify details and/or procedures as required and approved.

### 3.4 HIGH-STRENGTH BOLT INSTALLATION

- A. General: Supply and install all high-strength bolts, nuts, and washers in conformance with the requirements of the current edition of "Specification for Structural Joints using ASTM A325 or A490 Bolts," except that the installation of "turn-of-nut tightening" will not be accepted.
  - 1. All high-strength bolts, both friction and bearing type, shall be installed in accordance with Paragraph 8(d)(4), "Direct Tension Indicator Tightening," unless noted otherwise on the drawings.
  - 2. Load-indicator washers (LIW) or tension control bolts (TCB) shall be used as the authorized direct tension indicator.
  - 3. Load-indicator washers per ASTM F959 shall be supplied and installed in accordance with the manufacturer's written procedures.
  - 4. Tension control bolts shall be supplied and installed providing shearing of the bolt tip in accordance with ASTM F1852 and in accordance with the manufacturer's written procedures.

**END OF SECTION**