

SECTION 05 10 00

STRUCTURAL METAL FRAMING

PART 1 -- GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies structural metals consisting of standard shapes, fasteners, rods and plates that are used in structural framing, supports, bracing members, and connections.

B. QUALITY ASSURANCE:

1. Structural assemblies and shop and field welding shall meet the requirements of the AISC Manual of Steel Construction and the AISC Specification for Structural Steel Building.
2. The use of salvaged, reprocessed or scrap materials shall not be permitted.

C. QUALIFICATIONS:

1. STEEL FABRICATOR:

- a. Minimum of (10) ten years of experience in fabrication of structural steel.

2. STEEL ERECTOR:

- a. Minimum of (10) ten years of experience in erection of structural steel.
- b. With an active and enforced quality assurance program in place, as described in the California Building Code.

3. Qualify welding procedures and welding operators in accordance with AWS.

1.02 REFERENCES

- A. REFERENCE STANDARDS: The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern, except where a specific date or edition is given below. In case of conflict between the requirements of this section and the listed standards, the requirements of this section shall prevail.

<u>Reference</u>	<u>Title</u>
CBC	California Building Code, 2019 edition
AISC 341-16	Seismic Provisions for Structural Steel Buildings Including Supplement #1
AISC 360-16	Specification for Structural Steel Building
AISC Manual	American Institute of Steel Construction, of Steel Manual of Steel Construction
ASTM A6	General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A36	Structural Steel
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc- Coated Welded and Seamless
ASTM A193	Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A194	Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service
ASTM A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes.
ASTM A307	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A320	Alloy Steel Bolting Materials for Low-Temperature Service
ASTM A325	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A380	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
ASTM A490	Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength

<u>Reference</u>	<u>Title</u>
ASTM A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A563	Carbon and Alloy Steel Nuts
ASTM A992	Steel for Structural Shapes for Use in Buildings
ASTM B209	Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B241	Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
ASTM B308	Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded
ASTM F436	Standard Specification for Hardened Steel Washers
AWS B3.0	Welding Procedure and Performance Qualifications
AWS D1.1	Structural Welding Code - Steel
AWS D1.2	Structural Welding Code – Aluminum
AWS D1.6	Structural Welding Code – Stainless Steel

B. DEFINITIONS:

1. Descaling: Removal of heavy, tightly adherent oxide films resulting from hot-forming, heat-treatment, welding, and other high-temperature operations.
2. Pickling: Chemical descaling of stainless steel using aqueous solutions of nitric and hydrofluoric acid, or various proprietary formulations as specified.
3. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.

1.03 SUBMITTALS

- A. The following submittals shall be submitted for review in accordance with the SUBMITTALS PROCEDURES Section (01 33 00):
 1. A copy of this specification section, with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.
 2. Complete shop drawings, including erection plans, member and connection details, steel materials, coatings, etc. as required to fully delineate this portion of the work.
 3. Certification that steel fabricator is approved to perform steel fabrications without special inspection.

4. Welder's qualification certificates stating that welders to be employed in the work have satisfactorily passed AWS qualification tests applicable to the welding to be performed on this project.
5. Welding procedure specifications (WPS) in accordance with AWS D1.6.
 - a. Submit WPS for each type of welded joint used, whether prequalified or qualified by testing.
 - 1) State electrode manufacturer and specific electrodes used.
 - 2) Indicate required AWS qualification for joint.
 - b. Submit WPS with shop drawings that indicate those welds.
 - c. Submit Procedure Qualification Record (PQR) in accordance with AWS D1.6 for welding procedures qualified by testing
6. Certified mill test reports for stainless steel and bolts and nuts.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. STEEL:

1. Materials for steel shall be as specified in Table A.

Table A, Steel Materials

<u>Material</u>	<u>Specification</u>
Standard rolled steel wide flange sections (and WTs)	ASTM A992
Structural steel S-shapes, channels, angles and plates	ASTM A36
Pipe sections for posts, guardrails and handrails	ASTM A53, Type E or S, Grade B
Hollow Structural Steel (HSS)	ASTM A500, Grade B (Fy = 46 ksi)
Stainless steel plates, sheet, and strips	ASTM A240, Type 304L
Stainless steel bars and shapes	ASTM A276, Type 304L
Stainless steel bolts (used at stainless steel and aluminum framing unless noted otherwise)	ASTM A193, Grade B8M Class 2, AISI 316
Stainless steel nuts and washers (used at stainless steel and aluminum framing unless noted otherwise)	ASTM A194 Grade 8M, SS316
High strength steel bolts (used at galvanized and painted steel framing)	Galvanized ASTM A325 (Type 1), shear/bearing application using snug-tightened or pretensioned joints.
Nuts and washers for high strength bolts	Galvanized and lubricated nuts ASTM A563 and galvanized washers ASTM F436

B. ALUMINUM:

1. Unless otherwise specified, aluminum shall be extruded from 6061-T6 or 6063-T6 alloy, conforming to ASTM B308. Aluminum guardrail and handrail pipe shall be Alloy 6061-T6 per ASTM B241. Aluminum Plates shall be Alloy 6061-T6 per ASTM B209. Bolts shall be stainless steel bolts for aluminum framing (see Table A above).

C. BITUMASTIC COATING:

1. Material shall be Kop-coat, bitumastic black solution; Porter, Tarmastic No. 100, Tnemec 499 heavy-duty black; or equal.

2.02 FABRICATION

- A. Fabrication shall be in accordance with the AISC Manual of Steel Construction. Aluminum fabrication shall be in accordance with the Aluminum Association Specifications and Guidelines for Aluminum Structures.
- B. Provide as a minimum two (2) 3/4-inch-diameter, high strength bolts for all bolted connections, or indicated on the Drawings.
- C. FABRICATION TOLERANCES:
 - 1. MEMBER LENGTH:
 - a. Both ends finished for contact bearing: 1/32 inch
 - b. Framed members 30 feet or less: 1/16 inch
 - c. Framed members over 30 feet: 1/8 inch
 - 2. MEMBER STRAIGHTNESS:
 - a. COMPRESSION MEMBERS: 1/1000 of axial length between points laterally supported.
 - b. NON-COMPRESSION MEMBERS: ASTM A6 tolerance for wide flange shapes.
 - 3. SPECIFIED MEMBER CAMBER (EXCEPT COMPRESSION MEMBERS):
 - a. 50 feet or less: +1/2 inch.
 - b. Over 50 feet: +1/2 inch (plus 1/8 inch per 10 feet over 50 feet).
 - c. Members received from mill with 75 percent of specified camber require no further cambering.
 - d. Beams/trusses without specified camber shall be fabricated so after erection, camber is upward.
 - e. Camber shall be measured in fabrication shop in unstressed condition
- D. Cleaning and passivation of stainless steel members:
 - a. Following shop fabrication of stainless steel members and bolts, clean and passivate fabrications at point of manufacture.

- b. Finish requirements: Remove free iron, heat tint oxides, weld scale and other impurities, and obtain a bright passive finished surface with no etching, pitting, frosting, or discoloration.
- c. Provide quality control testing to verify effectiveness of cleaning agents and procedures and to confirm that finished surfaces are clean and passivated.
 - 1) Conduct sample runs using test specimens with proposed cleaning agents and procedures as required to avoid adverse effects on surface finishes and base materials.
- d. Pre-clean, chemically de-scale (“pickle”), passivate, and final-clean fabrications in accordance with the requirements of ASTM A380.
 - 1) If degreasing is required before cleaning (pickling) to remove scale or iron oxide, cleaning with citric acid treatments is permissible; however, such treatments shall be followed inorganic cleaners.
 - 2) Pickle and passivate stainless steel using a nitric acid solution in accordance with ASTM A380, Annex A2, Table A2.1, Part II.
 - 3) Pickling by citric acid treatment or sulfuric acid treatment is not considered to satisfy the requirements of this Section.

PART 3 -- EXECUTION

3.01 GENERAL

- A. Measurements shall be verified at the job.
- B. Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise specified. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or drilled. No drifting of bolts nor enlargement of holes will be allowed to correct misalignment. Mismatched holes shall be corrected with new material.
- C. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Aluminum in contact with concrete or grout shall be protected with multiple heavy coats of bituminous paint to a minimum dry film thickness of 10 mils.
- D. Structural steel completely encased in concrete shall not be painted and shall have a clean surface for bonding to concrete. Metalwork which is bent, broken or otherwise damaged shall be repaired or replaced by the Contractor.
- E. Until all elements of the permanent structure and lateral bracing system are complete, provide temporary bracing designed, furnished, and installed by the Contractor for the partially complete structure.

3.02 INSTALLATION

A. WELDING:

- 1. Welding shall be done by operators who have been qualified to perform the type of work required by tests as prescribed by AWS. Welding procedures and welding operators shall be qualified in accordance with AWS D1.6 for stainless steel construction. Provide certifications that welders to be employed in the work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, retesting will be the Contractor's responsibility.
- 2. The quality of welding shall conform to AWS Code for Arc Welding in Building Constructions, as applicable. Steel which is required to be coated for corrosion protection shall be continuously welded at all joints.
- 3. Unless otherwise specified, continuous welds shall be provided on all structural members exposed to weather or submerged in water or wastewater. Continuous seal welds shall be provided on all sides of all plates or structural shapes in contact with or submerged in water or wastewater.

B. BOLTED CONNECTIONS:

1. Bolted connections shall conform to AISC Framed Beam Connections, unless shown otherwise on the drawings, and shall be bearing type connections with threads excluded from shear planes. Bolts shall be fully tensioned unless connecting HSS shapes or indicated on the Drawings to be snug-tightened.

3.03 CORROSION PROTECTION (NOT USED)

3.04 CLEANING (NOT USED)

3.05 TESTING

- A. The District will engage inspectors to inspect welded connections and to perform non-destructive tests at the fabrication shop. The inspection and tests will be paid for by the District.
- B. Welds that are required by the District to be corrected shall be corrected or redone and retested as directed, at the Contractor's expense and to the satisfaction of the District.
- C. The costs for all initial testing shall be paid by the District. However, the Contractor shall pay for all costs for any additional testing and inspection on work which does not meet specifications.

3.06 TRAINING (NOT USED)

****END OF SECTION****