

SECTION 05 10 00**STRUCTURAL METAL FRAMING****PART I GENERAL****1.01 RELATED DOCUMENTS**

- A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.02 SUMMARY

- A. The Work required under this Section consists of structural steel, steel erection, shop painting, field touch-up painting, and related items necessary to complete the Work indicated.
- B. Miscellaneous angles, channels, anchor bolts, bent plates, sleeves, sag rods, leveling plates, bearing plates for structural steel and steel joists, and other incidental items of structural steel required to be built into concrete or masonry shall be provided as indicated or specified and be furnished to respective trades at proper time; including instructions and templates for their installation.
- C. Provide, where specifically called for, loose lintels, steel shelf angles, perimeter angle closure, and accessories.
- D. For openings in metal deck 12 by 12 inches and larger, provide steel reinforcing members on all sides of opening. Reinforcing shall be not less than 3 by 3 inches by 3/8 inch angles, unless otherwise indicated. Openings in deck shall be cut under Section 05300 - Metal Deck.
- E. Related Work Specified Elsewhere
 1. Division I — Quality Control.
 2. Section 05 50 00 — Metal Fabrications: For miscellaneous steel framing.
 3. Section 09 91 00 — Painting.
 4. Section 03 30 00 -- Cast-in-Place Concrete
- F. Refer to Section Division I for Alternates that may affect the Work of this Section.

1.03 SUBMITTALS

- A. Approved manufacturer's published complete product data for:
 1. Proposed base plate grout.
- B. Complete shop drawings by approved fabricator including dimensioned plan layouts of columns and anchor bolt locations, dimensioned erection diagrams, and shop detail drawings. Symbols and indications used for structural components on design drawings must appear identically on submitted shop drawings. Types of electrodes proposed for welding processes must also appear thereon.
 1. The fabricator must review and check shop drawings prepared by the fabricator or the fabricators subcontractors prior to submission to the Structural Engineer (SE).
 2. AutoCAD drawings, for use in preparation of erection plans and shop drawings: Floppy disk copy of Drawings may be available from the SE. The Contractors

requiring this service must contact the SE to verify availability and receive a price quote. Cost for floppy disk copy will be established on an individual basis relative to the time required to copy and process the information. Request for floppy disk copy should be addressed to the Project SE.

3. Changes to shop drawings for resubmissions shall be "clouded" or "flagged" to clearly indicate all changes, additions, or deletions to the previous submission. Resubmissions will be reviewed only to verify those items clouded or flagged. All other information will be assumed to be unchanged from the previous submission.
- C. Letter from a Professional Engineer licensed within the state of construction activities certifying that he has carefully studied the design drawings, that shop drawings have been prepared under his direct guidance and supervision, and that provided components and connections will meet or exceed loading requirements, where loads are shown at element ends. NE's full signature and seal of authenticity must evidence such letter of certification. It should not be expected that NE's review of shop drawings will begin until such certification has been received. This certification is to verify the adequacy of members and connections designed by the fabricator and are not intended to require verifications of the design of structural elements shown in the plans.

1.04 QUALITY ASSURANCE

- A. Structural fasteners shall be manufactured in the United States. Fabricator shall furnish proof of U.S. manufacturer. If it becomes necessary to use imported fasteners, each size, type, and each large quantity package (500 pcs. or more) shall undergo a random sampling of a minimum 5 pieces for testing, and the test results to be provided to NE. Test shall be performed by an independent testing agency, and the cost shall be included in the Base Bid. If inferior fasteners are discovered, all fasteners of that type shall be removed and replaced with acceptable fasteners at no cost to the Owner. If possible, fasteners shall be tested prior to use in construction.
- B. Comply with the provisions of applicable building codes as well as the following specific requirements: (Latest Edition)
1. AISC "Code of Standard Practice for Steel Buildings and Bridges."
 2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and including the "Commentary of the AISC Specification," and the current supplements.
 3. AISC "Specifications for Structural Joints using ASTM A325 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
 4. AWS "Structural Welding Code," AWS D1.1 and its latest revision.
 5. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piping, and Bars for Structural Use."
- C. Structural Steel Alignment Quality Control: Refer to Division 1 - Quality Control.
- D. See Section 3.05 – Field Quality Control for additional requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- C. Store materials to permit easy access for observation and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.01 FABRICATORS

- A. Firms acceptable as fabricators for structural steel work under this Section shall be certified in the category of "Conventional Steel Buildings (Sbd)" by the American Institute of Steel Construction or shall include in their bid the amount of \$2000 to cover the cost of inspections by an independent testing agency to verify that the fabricator is capable of performing the desired level of quality in the work to be performed. The fabricator shall cooperate with and make available to the testing agency records and documents which focus on general management, engineering and drafting, procurement, operations and quality control and shall allow access to facilities to allow the testing agency to examine actual fabrication work in the shop and drafting room at the time of the inspection.

2.02 MATERIALS

- A. Structural Steel Angles, Plates, and Bars: ASTM A572 Grade 50, unless otherwise noted.
- B. Rolled Steel Shapes (Wide Flanges and WT Shapes): ASTM A992 (Fy=50 ksi).
- C. Hollow Structural Sections
 - 1. Square, Rectangular, and Special Shapes: ASTM A500, Grade B (Fy=46 ksi).
 - 2. Round, Structural Steel Pipe: ASTM A53, Type E or S, Grade B or ASTM A500, Grade B (Fy=46 ksi).
- D. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325. Use 3/4 inch bolts, unless noted otherwise on the Drawings.
 - 2. Direct tension indicator washers may be used at Contractors option per ASTM F959.
- E. Electrodes for Manual Shielded and Metal-Arch Welding: AWS Code and ASTM A233, Series E60 and E70 as required.
- F. Electrodes and Flux for Submerged Arc Welding: AWS Code and ASTM A588, Series F60 and F70 as required.
- G. Structural Steel Primer Paint: Steel Structures Painting Council (SSPC) - Paint 15.

- H. Shrinkage-Resistant Grout (SR-G): CE (Corps of Engineers) CRD-C621 latest edition (formerly CRD-588) and ASTM C 1107, premixed, factory-packaged, flowable, mortar grouting compound with a minimum compressive strength of 9000 psi at 28 days. Products offered by manufacturers to comply with the requirements include the following:
1. Non-Ferrous Aggregate
 - a. Five Star Fluid Grout 100; Five Star Products, Inc., Fairfield, Connecticut.
 - b. Crystex; L&M Construction Chemicals, Inc., Omaha, Nebraska.
 - c. Sure-Grip High Performance Grout; Dayton Superior Corp., Miamisburg, Ohio.
 - d. SonnogROUT 10K; Sonneborn Building Products, Shakopee, Minnesota.
 - e. Sealtight Pack-H Grout; W. R. Meadows, Inc., Hampshire, Illinois.
 - f. Enduro 50; Conspec Marketing & Manufacturing Co., Inc., Kansas City, Kansas.
- I. Masonry Bearing Plates
1. All joists shall bear on masonry bearing plates with anchor rods embedded in the masonry below. Weld joists to bearing plates in accordance with SJI Specifications. See Framing Details and Plans for bearing plate sizes.
 2. All beams shall bear on masonry bearing plates with anchor rods embedded in the masonry below. Weld beams to bearing plates unless otherwise noted.
 3. Bearing plates are to be set under the work of Division 4 – Masonry.
- J. Where plate girders are indicated, they shall be full length members or members with needed bolted moment splices, welded with full-penetration welds ground flush with grinding in the direction of applied stress and with weld soundness established by radiographic or ultrasonic observation in accordance with the requirements of 9.25.2 or 9.25.3 of AWS DI .1. Splices in the center third section of these girders will not be permitted.
- K. Where trusses are indicated with continuous members, they shall be full length without splices or welded with full-penetration shop or field welds ground flush with grinding in the direction of applied stress and with weld soundness established by radiographic or ultrasonic observation in accordance with the requirements of 9.25.2 or 9.25.3 of AWS DI .1. Splices will not be permitted at points of maximum stress. Field splices of tension members shall be designed to develop 110 percent of the spliced sections and shall be full-penetration welds as described above. All field splices shall be full-penetration welds as described above.
- L. Anchor bolts - threaded rods per ASTM A307.
- M. Structural Slide Bearings: Amcott Structural Products Corp., Dover, New Jersey; AMSLIDE AB-AS12-C2 or a proposed equal product from Con-Serv, Inc., Georgetown, South Carolina or Seismic Energy Products L.P., Athens, Texas.
1. Product shall perform in accordance with the following properties:
 - a. Teflon to Teflon; Coefficient of Friction: .04 to .06.
 - b. Compressive Creep After 24 Hours at 200 psi (unbonded), ASTM D-621-59: 3.9 percent.
 - c. Tensile Strength, ASTM D-1457-56T: 2700 psi.
 2. Bearing plates shall be sized to limit bearing pressures to 1000 psi for concrete and 250 psi for masonry.
- N. Adhesive Anchor Bolts
1. Concrete Base Material: Refer to Section 03 20 00 - Concrete Reinforcing.

2. Masonry Base Material: Refer to Section 04 05 19 - Masonry Anchorage and Reinforcing.
- O. Preformed Joint Material: Provide closed cell polyethylene expansion joint material equal to the following manufacturers:
1. Sonoflex F; Sonnebom Building Products, Shakopee, Minnesota.
 2. Deck-O-Foam; W. R. Meadows, Inc., Hampshire, Illinois.
 3. Econo Foam; Williams Products, Inc., Troy, Michigan.

2.03 FABRICATION

- A. General: Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the final shop drawings. Provide camber in structural members as shown.
1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 2. Where finishing is required, complete the assembly, including riveting and welding of units, before start of finishing operations.
- B. Connections
1. Weld or bolt shop connections as shown.
 2. Bolt field connections, except where welded connections or other connections are shown or specified.
- C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints."
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp.
- E. Galvanizing
1. Provide a zinc coating for those items shown or specified to be galvanized, as follows:
 - a. ASTM A123 for galvanizing rolled, pressed, and forged steel shapes, plates, bars, and strip 1/8 inch thick and heavier.
 2. Lintels in exterior walls and in other walls exposed to moist environments shall be hot-dipped galvanized.
 - a. Lintels consisting of a plate and rolled beam W16 and smaller shall have both plate and beam galvanized after welding.
 - b. Lintels consisting of a plate and rolled beam larger than W16 shall have plate galvanized and beam painted a cold applied mill galvanizing.
- F. Holes for Other Work: Provide holes required for securing other work to structural steel framing, such as nailers, plates, and for the passage of other work through steel framing members, as shown on the final shop drawings. Provide threaded nuts welded to framing and other specialty items as shown to receive other work.

2.04 FINISHES

- A. General: Shop paint structural steel work, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on the exposed portions and the initial 2 inch of embedded areas only. Do not paint contact surfaces that are to be welded or high-strength bolted with friction-type connections. Coat with tar all steel encased in concrete and/or masonry below adjacent

slab on grade.

1. Structural steel work that will be receiving sprayed-on fireproofing shall be unprimed.
- B. Surface Preparation: After observation and before shipping, clean steel work to be painted. Remove loose rust, mill scale, and spatter, slag or flux deposits. Clean steel in accordance with SSPC (Steel Structures Painting Council) as follows:
 1. SP-2 "Hand Tool Cleaning"
- C. Painting: immediately after surface preparation, apply structural steel rust inhibitive primer paint in accordance with the manufacturer's instructions and at a rate to provide a uniform dry film thickness of 1.5 mils. Use painting methods that will result in full coverage of joints, comers, edges, and exposed surfaces.
- D. Galvanizing: Joints between plates and beams and between intermittent welds shall be touched-up with cold applied galvanizing coating as required to insure uniform coating.
 1. Galvanized Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21 035A or 95 PC-Paint 20.

2.05 SOURCE QUALITY CONTROL

- A. The materials and workmanship to be furnished under this Specification shall be subject to observation in the mill, shop, and field by the NE. Observation will be conducted without expense to the Contractor; however, observation in the mill or shop shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with contract requirements.
- B. Refer to Division 1- Quality Control.

PART 3 EXECUTIONS

3.01 EXAMINATION

- A. Erector must examine the areas and conditions under which structural steel work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.

3.02 ERECTION

- A. General: Comply with the AISC Specifications and Code of Standard Practice and with specified requirements.
- B. Surveys and Bench Marks: Establish permanent bench marks as shown and as necessary for the accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces and locations of anchor bolts and similar devices before erection work proceeds and report measurement discrepancies to the A/E. Do not

proceed with erection until corrections have been made or until compensating adjustments to the structural steel work have been agreed upon with the NE.

- C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members as required, with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds.
- D. Temporary Planking: Provide temporary planking and working platforms as required and as necessary to effectively complete the work.
- E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
 - 1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
 - 2. Refer to Division 3 of these Specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation, if required.
 - 3. Where anchor bolts are broken after installation, the concrete shall be removed around the remaining portion of the bolt in the concrete to a depth of 1/2 inch below the top of the bolt. A new segment of bolt of the same steel strength shall be full penetration welded to the remaining bolt in the concrete. The new segment of bolt shall be tapered on the welded end to a 30 degree bevel all around to leave a thickness at the beveled end of 1/4 inch.
 - 4. Where anchor bolts are incorrectly located in the concrete or masonry which encases them, the following procedures shall be used.
 - a. For bolt misalignment less than 5/16 inch: offset the column with base plate as required to locate column correctly. The 5/16 inch oversized holes in the column base plates will allow this movement without modification to the column or the anchor bolts:
 - b. For bolt misalignment more than 5/16 inch and less than 2 inches: cut and remove base plate from column, relocate base plate and reweld to column.
 - c. For bolt misalignment more than 2 inch and less than 6 inches: cut off anchor bolts flush with surface of concrete or masonry and install adhesive anchor bolts as specified in Division 4 for masonry and Division 3 for concrete base material.
- F. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.
 - 1. Setting Plate Procedure
 - a. Set loose and attached base plates and bearing plates for structural members on wedges or other adjustable devices.
 - b. Tighten the anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims, but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.
 - c. Pack bedding grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturers instructions, or as otherwise required.

2. Double Nut Procedure
 - a. Install lower nuts and washers to required elevation.
 - b. Erect column and install upper nuts and washers.
 - c. After structure has been erected and plumbed, adjust lower nuts to relieve racking, adjust elevation, and distribute load equally to all anchor bolts.
 - d. Tighten upper nuts.
 - e. Pack bedding grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturers instructions, or as otherwise required.
- G. Field Assembly: Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of the structure within specified AISC tolerances.
 2. Splice members only where shown or specified, unless approved otherwise by the A/E or his representative.
- H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
- I. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to field welds.
 1. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- J. Gas Cutting: Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing.
- K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint. Apply paint to exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
- L. Lintels and Shelf Angles: Weld or bolt members together where so indicated.
 1. Lintels shall have 8 inch bearing at each end, minimum, unless shown otherwise. Bearing pressures shall not exceed the allowable stress for masonry.
 2. Where shelf angles are attached to concrete with bolts and adjustable inserts, provide slotted holes of proper size and spacing in the vertical leg of shelf angles.

3.03 HIGH STRENGTH STEEL BOLTS

- A. Structural joints using high strength bolts, hardened washers, and nuts shall be tightened to a high tension; the materials, methods of installation and tension control, type of wrenches to be used, and observation methods shall conform to specifications for "Structural Joints using ASTM A325 or A490 Bolts," as approved by the Research Council

on Structural Connections of the Engineering Foundation, Latest Edition.

- B. The high strength bolts used shall have a suitable identifying mark placed on top of the head before leaving the factory.
- C. All high strength bolted connections shall be "snug-tight" connections, unless otherwise indicated on the Drawings.
 - 1. "Snug-tight" is defined as the tightness that exists when all plies in a joint are in firm contact and can be attained with a few impacts of an impact wrench or by the full effort of a person using an ordinary spud wrench.
- D. Where specifically noted on the Drawings, bolted connections shall be installed "slip-critical".
 - 1. Tightening of nuts shall be done by the turn-of-nut method, according to the Specifications for Structural Joints" using ASTM A325 or A490 bolts," endorsed by AISC, unless direct tension indicator washers are used, in which case tightening will terminate when the proper gap is attained.
 - 2. For the "turn-of-nut" method, bolts that have been "snug-tight" shall be marked on both the bolt head and the nut with an identifying symbol, and then given an additional fraction of a turn as specified in Table 5 of the above referenced specification. Marks shall be such that visual observation can be made of finished connections. Snug-tight is defined as the tightness developed by the full effort of a man using a spud wrench on all bolts in the connections.
 - 3. Slotted holes will be allowed in following locations, only and shall have snug tight bolted connections:
 - a. The outstanding legs of angles used in beam shear splices.
 - b. Hip and valley beams where both ends frame into steel members in an all steel frame.
 - c. Diagonal or skewed beams where both ends frame into steel members in an all steel frame.
 - d. Other connections where specifically detailed in the drawings.
 - e. All other holes shall be standard bolt holes (1/16 inch larger than bolt).

3.04 ERECTION ALIGNMENT

- A. Framing: The framing shall be carried up true, plumb, and level within a tolerance of 1:500; and temporary bracing shall be introduced, wherever necessary, to take care of loads to which the structure may be subjected, including erection equipment and its operation. Such bracing shall be left in place as long as may be required for safety. The Contractor as part of his equipment shall finally remove it. As erection progresses, the Work shall be securely connected to take care of dead load, wind, and erection stresses.

3.05 FIELD QUALITY CONTROL

- A. Contractor shall retain an independent testing agency to check connection and fastening as specified herein. Conform to Division One — Quality Control.
- B. Steel (includes work for metal joists and metal deck).
- C. Structural Steel
 - 1. The Testing Agency shall conduct and interpret tests and state in each report whether test specimens comply with the requirements, and specifically state any deviations from requirements.
 - a. Contractor shall provide access for the Testing Agency to places where structural steel is being fabricated or produced so inspection and testing can

- be accomplished.
2. Bolted Connections: Inspection in accordance with AISC Specification for Structural Joints, as follows:
 - a. Visually inspect all bolts
 - b. Check for proper torque with a calibrated torque wrench
Minimum two bolts of alternate design connections between floor beams and girders. Minimum two bolts of every connection between girders and columns.
 - c. All bolted connections that fail shall be corrected and all bolts in that connection shall be retested. The cost of retests on connections that fail shall be borne by the contractor.
 3. Field Welding: During erection of structural steel, inspect and test assemblies in accordance with AWS Structural Welding Code and as follows:
 - a. Perform visual inspection of all welds and test those which are questionable.
 - b. Perform non-destructive tests of weld as required above, as follows:
 - 1) Fillet Welds: One spot test per member. Magnetic particle testing may be used.
 - 2) Partial Penetration Welds: One spot test per weld using ultrasonic testing techniques.
 - 3) Full Penetration Welds: One spot test per weld for shop welds and the entire length of all field welds. Use radiographic or ultrasonic testing techniques.
 - c. Ultrasonic inspection shall be performed on all welds subject to tension in moment connections. See drawings for locations. In addition, any other welds in question or selected at random by the inspector or Structural Engineer shall be tested by this method. When ultrasonic inspection is used, 100 percent of the length of the weld shall be inspected. Any retesting required shall be paid for by the Contractor responsible for workbeing tested.
 - d. Re-inspect and retest defective welds which have been re-welded. The cost of re-welding, re-inspection and retesting shall be paid by the Contractor.

END OF SECTION

SECTION 05 50 00**METAL FABRICATIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- B. Section 09 90 00 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2005.
- B. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.
- C. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.
- D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.
- E. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003 (Reapproved 2007).
- F. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2007a.
- G. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2007.
- H. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2007.
- I. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2007.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2006 and Errata.
- L. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).
- M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
- N. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.
- C. Plates: ASTM A 283.
- D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
 1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
 2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
 3. Space rungs 7 inches from wall surface.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of masonry; galvanized finish.
- C. Lintels: As detailed; galvanized finish.
- D. Security Window Bars: Formed plate steel frame and pipe bars as detailed on drawings.

2.04 FINISHES - STEEL

- A. Prime paint all steel items.
 - 1. Exceptions: Galvanized items to be embedded in concrete or masonry.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M requirements.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION