

SECTION 05 21 00

STEEL JOIST FRAMING

PART 1 – GENERAL

1.1 PURPOSE

- A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA and may require justification through Life Cycle Cost (LCC) analysis and submitted to UTA for approval.

1.2 LESSONS LEARNED AND DESIGN CONSIDERATIONS

- A. **Any specialized joists shall be identified as it may impact construction schedule.**

1.3 REFERENCED DOCUMENTS

- A. The Drawings and General Provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to work specified in this Section.

1.4 DESCRIPTION OF WORK

- A. Work Included: Furnish all engineering, labor, materials, and equipment in conjunction with furnishing, manufacture, and erection of all open web joists and joist girders, including:
 - 1. Bridging.
 - 2. Ceiling extensions.
 - 3. Bearing plates.
 - 4. Side wall anchors.
 - 5. Extended ends.
 - 6. Connections.
 - 7. Fabrication inspection and testing.
- B. Related Work Specified Elsewhere:
 - 1. Metal roof decking: Section 05 31 23.
 - 2. Structural steel:
 - 3. Section 05 50 00.
 - 4. Testing laboratory inspection for verification of quality: Division 01.
 - 5. Sustainable construction for LEED requirements: Division 01.

1.5 QUALIFICATIONS

- A. Manufacturer shall be a member of the Steel Joist Institute and shall have been engaged in the design and manufacture of similar units for a period of not less than 5 years.
- B. All welding, both shop and field, shall be done by AWS qualified welders. Qualification tests shall include welds of the type used in joist construction.

1.6 CODES AND STANDARDS

- A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between Contract Documents and a referenced standard, Contract Documents shall govern.
- B. Open web steel joists shall be designed and fabricated in accordance with Standard Specifications for Open Web Steel Joists, K series, adopted by the Steel Joist Institute.
- C. Long span steel joists shall be designed and fabricated in accordance with Standard Specifications for Long Span Steel Joists, LH series, and deep long span steel joists, DLH series, adopted by the Steel Joist Institute.
- D. Joist girders shall be designed and fabricated in accordance with Standard Specifications for Joist Girders, adopted by the Steel Joist Institute.
- E. Shop welds shall comply with Standard Specifications of the Steel Joist Institute, for applicable joist series.
- F. Field welds shall comply with AWS D1.1, Structural Welding Code - Steel, of the American Welding Society, latest edition.

1.7 QUALITY CONTROL

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- A. Manufacturer shall visually inspect connection welds and have a program for regular sampling and testing of connection welds.
- B. Manufacturer shall have a program for establishing shop weld procedures and qualifying welding operators through AWS qualification tests.
- C. Contractor shall be responsible for qualifying welding operators for field welding work, in accordance with AWS Standard Qualification Procedure. Provide certification, to Owner's testing laboratory, that welders to be employed in work have satisfactorily passed AWS qualification tests within the previous 12 months. If recertification of welders is required, retesting will be Contractor's responsibility.
- D. All fabrications and erection of joists and joist girders, and connections to supporting members shall be subject to inspection and testing by an independent testing laboratory, both in the plant and at jobsite. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Promptly remove and replace materials or fabricated components which do not comply.
- E. Refer to Division 01 for testing laboratory services.

1.8 SUBMITTALS

- A. See Division 01 for submittal procedures.
- B. Shop Drawings: Submit detailed fabrication and erection drawings for all joists and joist girders. Shop drawings shall include dimensioned setting plans, piece fabrication drawings (shop tickets), connection details, bridging, camber, coatings, chord sizes, material properties, and uplift capacity.
- C. Submit, for Architect's records, copies of certified mill tests indicating material compliance with ASTM and SJI Specifications.
- D. Submit, for Architect's records, a record of design verification tests evidencing compliance with SJI Specifications regarding joint capacity and member strength.
- E. Submit 2 copies of design calculations for all joist girders, and for joists for which the standard load tables are not applicable, prior to or with shop drawings. Calculations shall bear the seal of a Licensed Professional Engineer, licensed in the State of Texas. Shop drawings submitted without corresponding calculations will be returned unchecked as an incomplete submittal. Calculations will be reviewed for loading conditions and deflection criteria. Any exceptions will be noted and the applicable pages will be returned to the manufacturer for correction or clarification.
- F. Submit, at completion of fabrication, a certificate of compliance in accordance with International Building Code Section 1704.2.2 stating that work was performed in accordance with approved construction documents and with SJI standard specifications.
- G. LEED Documentation Submittals: These submittals are to be submitted one time with related submittals and/or if any changes exist during construction.
 - 1. Credit MR4.1 and 4.2: Provide a final summary at the end of construction documenting total recycled content in building materials.
 - a. Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
 - b. Letter Template as appropriate to submittal content with actual values input.
 - 2. Credit MR5 and 5.2: Provide a final summary at the end of construction documenting total regional materials used:
 - a. Product Data indicating location of material manufacturer for regionally manufactured materials.
 - 1) Include statement indicating cost, and distance from manufacturer to Project for each regionally manufactured material.
 - 2) Include statement indicating cost, and distance from point of extraction, harvest, or recovery to Project for each raw material used.
 - b. Letter Template as appropriate to submittal content with actual values input.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver AESS to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.
- C. Erect pre-painted finish pieces using padded slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member's frames. Weld tabs for temporary bracing

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and safety cabling only at points concealed from view in the completed structure or where approved by the Architect during the pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Architect prior to erection

PART 2 – PRODUCTS

2.1 MATERIALS

- A. High Materials Shall Conform to the Following Requirements:
 - 1. Steel accessories: Bearing plates, bridging, wall anchors, etc., shall conform to the current edition of ASTM A36.
 - 2. Bolts: Shall conform to ASTM A307.
 - 3. Welding electrodes: Shall conform to requirements of the specified SJI Standards.
 - 4. Steel joists: Materials shall conform to requirements of the specified SJI Standards.
 - 5. Shop paint: Conform to requirements of SSPC-Paint 15, Type I

PART 3 – EXECUTION

3.1 DESIGN

- A. The Design all joists in accordance with referenced Steel Joist Institute Standards.
- B. Where applicable loading or span configuration is other than uniformly loaded simple span condition, as covered by Standard Load Tables adopted by Steel Joist Institute, joist manufacturer shall design joist for the specific condition shown on Drawings, and all temporary construction loading. Deflection of cantilever joists shall be limited to 1/240 of cantilever length

3.2 FABRICATION

- A. Contractor alone shall be responsible for errors in fabrication and for correct fitting of joists.
- B. Joints: Join members by welding in a manner that produces finished connection of ultimate strength, equal to twice the design strength required by standard load tables. Shop splices may occur in chord or web members. Members containing a butt weld splice shall develop an ultimate tensile force of at least 57,000 psi times the full design area of the chord or web, as verified by tests.
- C. Holes shall not be made or enlarged by burning, nor will burning of unfair holes in shop or field be permitted.
- D. Accessories: Provide all necessary sag rods, bridging, extended bottom chords and top chords, side wall anchors, wall connectors, headers, and ceiling extensions.
- E. Shop Paint: After fabrication, clean joists, bridging, anchors, etc., of rust, mill scale, dirt or other foreign material by approved methods. Remove grease or oil with benzene or similar volatile cleaner. After cleaning joists, bridging, etc., apply a coat (not less than 2.0 mils thick) of the specified paint, either by dipping or airless pressure spray. For joists exposed in crawlspace, after cleaning apply specified 2-coat paint system according to paint manufacturer's instructions or galvanize as specified.
- F. Extended Ends:
 - 1. Provide extended ends for top chords of joists where indicated. Extension members shall be designed as cantilever beams with their reactions carried back at least to the first panel point of the joist.
 - 2. Provide ceiling extensions of bottom chords of all joists.
- G. Joists shall be provided with positive camber of magnitude recommended by Steel Joist Institute for the various spans, unless another profile is shown.
- H. Welds Shall Meet the Following Criteria for Acceptance:
 - 1. Prior to inspection, weld slag shall be removed.
 - 2. Cracks are not acceptable and shall be repaired.
 - 3. Thorough fusion shall exist between weld and base metal, determined by visual inspection.
 - 4. Unfilled weld craters shall not be included in design length of the weld.
 - 5. Undercut shall not exceed 1/16" provided it is oriented parallel to principal stress.
 - 6. Sum of surface (piping) porosity diameters shall not exceed 1/16" in any 1" of design weld length.
 - 7. Weld spatter that does not interfere with paint coverage is acceptable.

3.3 ERECTION

- A. All erection procedures shall comply with AISC, SJI, OSHA and manufacturer's recommendations. Provide adequate temporary bracing and erection connections to assure safety and stability during erection and until permanent connections are completed.

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- B. Bridging shall conform to referenced SJI standards and information contained on Drawings. Provide and install extra bridging, where indicated, in addition to minimum Steel Joist Institute requirements. Locate bridging lines where shown, or if not shown, equally space within Steel Joist Institute's limitations.
- C. Minimum bearings and anchorage shall conform to referenced SJI standards and the Drawings as related to particular type of support.
- D. Set joists to lines, levels and spacing indicated. Provide bearing plates indicated and/or required to carry out structural requirements. Execute general handling and erection in accordance with referenced SJI standards.
- E. Joists shall be permanently fastened to supports and all bridging and anchorage completely installed before any construction loads are placed on joists.
- F. Execute field welding in accordance with AWS D1.1, "Structural Welding Code-Steel," as amended to date. Use only welding operators who have been previously qualified to perform type of work required.
- G. After erection, field connections and all abraded places of shop paint shall be touched up with same kind of paint as shop coat.

END OF SECTION