

SECTION 05 21 00
STEEL JOISTS and JOIST GIRDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Open web steel joists, joist girders, and shear stud connectors, with bridging, attached seats, anchors, and related items necessary to complete work indicated on the plans and this section.
- B. Loose bearing plates and anchor bolts for site placement.
- C. Framed floor and roof openings greater than 18".

1.2 REFERENCES

- A. AISC - Code of Standard Practice for Steel Buildings and Bridges
- B. AISI - Specifications for Structural Steel Buildings
- C. ASCE 7 - American Society of Civil Engineers – Minimum Design Loads of Buildings and Other Structures
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel
- E. ASTM A108 - Standard Specification for Steel Bars, Carbon, and Alloy, Cold-Finished
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
- G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
- H. ASTM A307 - Standard Specification for Carbon Steel and Studs, 60 000 PSI Tensile Strength
- I. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- J. ANSI/AWS A2.4 - Symbols for Welding, Brazing and Nondestructive Examination
- K. AWS D1.1/D1.1M - Structural Welding Code
- L. FM - Roof Assembly Classifications
- M. SJI (Steel Joist Institute) - Specifications, Load tables, and Weight Tables for Steel Joists and Joist Girders
- N. SSPC (Steel Structures Painting Council) - Paint Manual
- O. UL - Fire Resistance Directory
- P. FBC - Florida Building Code

1.3 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals Procedures
- B. Shop Drawings:
 - 1. Indicate standard designations, configuration, sizes, spacing, locations of joists and joist leg extensions.
 - 2. Joist coding, bridging, connections and attachments.
 - 3. Cambers and Loads
 - 4. Indicate welded connections with AWS A2.0 welding symbols, with the net weld lengths.
 - 5. Florida PE specializing in steel joist and girders shall prepare, sign, and seal the erection plans and joists fabrication plans.

1.4 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 - Submittals Procedures
- B. Manufacturer's Mill Certificate: Certify that Products meet or exceed specified requirements.
- C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.

- D. Welders' Certificates: Certify welders employed on the Work, verifying AWS qualifications within the previous 12-months.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SJI Load Tables and Weight Tables for steel joists and girders, including headers and other supplementary framing.
- B. Maintain one copy of each document on site.
- C. Fabricator: Company specializing in performing the work of this section with minimum 5-years documented experience.
- D. Erector: Company specializing in performing the work of this section with minimum 5-years documented experience.
- E. State of Florida Professional Structural Engineer experienced in design of connection details shall design all connections not detailed on the plans from the Architect/Engineer of record.

1.6 REGULATORY REQUIREMENTS

- A. Structural steel design and construction shall comply with FBC, ASCE 7 – Wind loads, and SJI "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Properly certified Welders shall perform all work in accordance with AWS standards.
- C. Conform to UL, FM, and Warnock Hersey Assembly.

1.7 DELIVERY, STORAGE AND PROTECTION

- A. Section 01 60 00 - Materials Equipment and approve equals: Transport, handle, store and protect product.
- B. Follow the requirements and recommendations of SJI and AISC for delivery, storage, and protection of materials.
- C. Bent joists members or broken welds are a cause for joist rejection, and require immediate replacement.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel joist fabrication materials shall comply with SJI and AISC standard specifications.
- B. Bolts, Nuts, and Washers: ASTM A307, A325, and A490 galvanized to ASTM A153/A153M for galvanized members.
- C. Shear Stud Connectors: ASTM A108, Grade 1015. Forged steel, headed, uncoated.
- D. Structural Steel for Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M
- E. Welding Materials: Use appropriate type per AWS D1.1 for materials
- F. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, provide a uniform dry film thickness of 2.0 to 3.5 mils.
 - 1. Properly prepare the surface, and immediately apply the primer.
 - 2. Do not apply primer to joist receiving spray-on fireproofing.
- G. Touch-up Primer for Galvanized Surfaces: SSPC 20 Type I - inorganic.

2.2 FABRICATION

- A. General; Fabricate steel joist and girders in accordance with SJI and AISC standard specifications and the following:
 - 1. Make all shop connections and splices with welds, shop bolted connection are not acceptable.
 - 2. Use only full-length web members, do not splice.
 - 3. Use uniform sizes throughout their length for top and bottom cords.
 - 4. Do not splice bottom cord members in the middle third of the span.

5. The fabricator shall certify any splice in the bottom cord member equals 100% the strength of the cord member.
- B. Provide extended ends in locations indicated on the plans per SJI requirements.
- C. Provide horizontal and/or diagonal type bridging in compliance with SJI requirements.
- D. Provide ceiling extensions on the bottom cord in areas with ceiling attached directly to the joist.
- E. Provide end anchorages, including steel bearing plates, to supporting structure.
- F. Provide header units to support tail joists at opening in the floor or roof system not framed with steel shapes.
- G. Top cords shall be absolutely across the full width and length for application of metal decking.
- H. Extend and connect the bottom cords to columns or webs of girders at column lines and where shown on structural plans.
- I. Bevel the joist ends when slope exceeds $\frac{1}{4}$ " in 12", may provide sloped shoes.

2.3 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP-2.
- B. Shop prime structural steel members
 1. Do not prime surfaces scheduled for fireproofing or field welding.
 2. Do not prime surfaces in contact with concrete.
 3. Do not prime surface of high strength bolts.
- C. Galvanize steel ledge angle members to ASTM A123/A123M; provide minimum 1.25 oz/sq ft galvanized coating.
- D. Shop Painting
 1. Remove all loose scale, rust, and other foreign materials from fabricated joist, girder, and accessories before applying paint.
 2. Spray, dip, or other approved method apply one shop coat of steel primer to steel joist, girder, and accessories, that applies a continuous paint film of at least 1.0 mil.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 31 00 – Project Management and Coordination: Verification of existing conditions prior to beginning work

3.2 ERECTION

- A. Install and secure steel joist and girders per SJI specifications, final shop drawings, and this section.
- B. Furnish anchor bolts, steel bearing plates, and other devices installed in concrete and masonry construction.
- C. Place steel joist on secure and completed supporting construction.
 1. Adjust and align in proper location and spacing before permanently fastening.
- D. Allow for erection loads, and sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- E. Install bridging simultaneously with joist/girder erection and before applying construction loads.
- F. Fastening of joists and girders:
 1. Field weld joists to supporting steel framework and steel bearing plates as indicated in SJI specifications for type of joist and per final shop drawings.

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2. Bolt joists and girders to supporting steel framework per SJI specifications and final shop drawings for type of joist.

3.3 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: $\frac{1}{4}$ "
- B. Maximum Offset from True Alignment: $\frac{1}{4}$ "

3.4 FIELD QUALITY CONTROL

- A. After installation of joists and girders, wire brush and clean with solvent before painting any unpainted surfaces, surfaces with rust, or surfaces damaged during erection.
- B. Section 01 40 00 - Quality Control: The A/E or the District may require field inspection, testing of bolt torque, welds and torque of fasteners.

END OF SECTION