

RENOVATIONS & ADDITIONS FOR WAYNFLETE ARTS CENTER – PHASE II
PORTLAND, MAINE

SECTION 05200 – OPEN WEB STEEL JOIST

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. Coordinate work with that of all trades affecting or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

- A. Extent of steel joists is shown on drawings, including basic layout and type of joists required, including auditorium roof trusses.
- B. Related work specified elsewhere:
 - 1. Section 05120 - Structural Steel
 - 2. Section 05300 - Metal Decking
 - 3. Section 05500 - Metal Fabrications

1.03 QUALITY ASSURANCE:

- A. Codes and Standards:
 - 1. Steel Joist Institute (SJI) Standard Specifications, Load Tables and Weight Tables- latest revisions-for:
 - a. K-Series Open Web Steel Joists as designated on the Contract Drawings.
 - b. LH/DLH Series Open Web Long Span Steel Joists and as designated on the Contract Drawings.
 - 2. Steel Joist Institute (SJI) Recommended Code of Standard Practice for Steel Joists and Joist Girders, latest revision.
 - 3. AWS D1.1 "Structural Welding Code" – Steel
 - 4. AWS D1.3 "Structural Welding Code" - Sheet Steel
 - 5. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

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- B. Qualification for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure".
 - 1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 - 2. If recertification of welders is required, retesting will be the Contractor's responsibility.

1.04 SUBMITTALS:

- A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 1.
- B. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.
- C. All submittals shall be reviewed and returned to the Architect within 10 working days.
- D. Incomplete submittals will not be reviewed.
- E. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.
- F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.
- G. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI Standard Specifications. Product data shall include:
 - 1. Joist steel component certified mill reports for each grade of steel covering chemical and physical properties and yield strengths.
 - 2. Steel joist primer paint.
 - 3. Welder certifications
- H. Shop Drawings:
 - 1. Shop Drawing Review: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop drawings and/or Erection Drawings is prohibited. Shop drawings and/or Erection drawings created from reproduced Construction Documents will be returned without review.

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- a. Review of the shop drawings will be made for the size and arrangement of the members and strength of the connections. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility. **Submit three prints. Prints will be reviewed by the Engineer, and then the Architect. One marked print will be returned to Contractor for printing and distribution. Multiple copies will not be marked by the Engineer.**
 - b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings indicating all joist members, bridging, connections and accessories. Incomplete submittals will not be reviewed.
2. Design
- a. Unless noted otherwise, steel joists shall be designed to support the uniformly distributed loads per the "Standard Load Tables" by the Steel Joist Institute. An allowance for MEP equipment and architectural component loads has been included in the uniformly distributed design loads. The joist design shall allow a 150 pound concentrated hanger load be applied at any location along either the top or bottom chord of the joists that is part of the MEP equipment and architectural component allowance, without additional reinforcement.
 - b. Calculations for SP joists: Submit design calculations for special steel joists indicated on Contract Drawings by SP designation, Auditorium roof trusses, or as otherwise noted. Submit calculations stamped by a Registered Professional Engineer licensed to practice in the State of Maine. Design joists for the loads indicated on the Contract Drawings with a vertical deflection due to live load not exceeding: 1/360 of the span for floor joists, 1/360 of the span for roof joists where plaster ceiling is attached or suspended, and 1/240 of the span for all other roof joists. Concentrated loads applied to SP joists and Auditorium roof trusses are to be applied as Live Loads unless otherwise indicated.
3. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.
4. LEED Documentation: Refer to paragraph 1.06 of this section and Section 01352.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

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- C. Deliver, store and handle steel joists as recommended in SJI Standard Specifications and SJI Technical Digest #9 “Handling and Erection of Steel Joists and Joist Girders”. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses. Protect joist members and packaged materials from corrosion and deterioration.

1.06 LEED Requirements:

- A. Material Recycled Content: Structural Steel shall be meet the following minimum recycled content:
 - 1. Post-consumer recycled content: 50%
 - 2. The sum of the post industrial and post consumer recycled content: 60%
 - 3. Submit invoices and documentation from manufacturer of the amounts of post-consumer and post-industrial recycled content by weight for products with specified recycled content.
- B. Local/Regional Materials: Hot rolled, milled shapes shall be produced within the continent of North America.
- C. Local/Regional Materials: Structural steel fabricator shall be located within 500 miles of the project location. Submit documentation of manufacturing locations and origins of materials for products manufactured within 500 miles of the building site.
- D. Waste Management: Collect offcuts and scrap and place in designated areas for recycling.

PART 2 PRODUCTS

2.01 MATERIALS:

- A. Steel: Comply with SJI Standard Specifications.
- B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel
- C. High-Strength Bolts and Nuts: ASTM A325, Type I, heavy hex structural bolts, heavy hex nuts and hardened steel washers.
- D. Steel Primer Paint: Manufacturer's standard shop paint conforming to Steel Structures Painting Council Specification: SSPC-Paint 15 “Steel Joist Shop Primer”, or a shop paint which meets the minimum performance requirements of SSPC-Paint 15.

2.02 FABRICATION:

- A. General: Fabricate steel joists in accordance with SJI Standard Specifications.

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- B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; deduct area of holes from the area of chord when calculating strength of member.
- C. Openings in Web: Coordinate openings in joist and joist girder webs to allow through passage of HVAC, sprinklers, etc. in locations shown on the drawings.
- D. Extended Ends: Provide extended ends on joists where shown and where deck extends beyond supports, complying with manufacturer's standards and requirements of applicable SJI Standard Specifications and Load Tables. Unless noted otherwise, "R" type extended ends shall be utilized.
- E. Uplift: Roof joists & auditorium roof trusses shall be designed for a net uplift of 18 psf. Eave overhangs at auditorium roof trusses shall be designed for a net uplift of 34 psf.
- F. Camber: Camber in accordance with SJI Standard Specifications. Joists shall not be manufactured with negative camber.
- G. Bridging:
 - 1. Provide horizontal or diagonal type bridging for "open web" joists, complying with SJI Standard Specifications and any additional requirements shown on Contract Drawings. Bridging layout shall be clearly indicated on the shop drawings.
 - 2. Provide bridging anchors for ends of bridging lines terminating at walls or beams.
 - 3. Provide bottom chord bridging for uplift, in accordance with SJI Standard Specifications, and SJI Technical Digest #6 "Structural Design of Steel Roof Joists to Resist Uplift Loads" when the above noted uplift load is greater than zero.
- H. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI Standard Specifications, unless otherwise indicated. Roof joists shall be anchored to resist the above noted uplift force. Auditorium roof trusses shall be anchored to resist the above noted uplift forces and axial loads indicated on the drawings.
 - 1. Minimum final connection each side of joist seat, unless noted otherwise, shall be as follows:
 - a. "K" Joists: 2 inches, 1/8" fillet weld or (2) 1/2" diameter A307 Bolts
 - b. "LH" Joists: 2 inches, 1/4" fillet weld, or (2) 3/4" diameter A325 Bolts (slip critical)
- I. Shop Painting:

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1. Remove loose scale, heavy rust and other foreign materials from fabricated joists and accessories before application of shop paint in accordance with SSPC-SP 1 and SSPC-SP 2.
2. Apply one shop coat of primer paint, SSPC-Paint 15, or better, to steel joists 2.0 to 3.0 mils DFT (dry film thickness) measurement in accordance with SSPC-PA
3. Top coat auditorium roof trusses per division 9 specifications.

PART 3 EXECUTION

3.01 ERECTION:

- A. General: Place and secure steel joists in accordance with SJI Standard Specifications, final shop drawings, and as herein specified. Comply with "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).
- B. Placing Joists:
 1. Do not start placement of steel joists until supporting work is in place and secured.
 2. Place joists on supporting work, adjust and align in accurate location and spacing before permanently fastening.
 3. Provide temporary bridging, connections and anchors to ensure lateral stability during construction.
- C. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.
- D. Fastening:
 1. Joist at column lines shall be bolted with a minimum (2) 3/4" diameter A325 bolts in a slip critical type connection. Stabilizer plates welded to the columns shall be provided bottom chord angles shall at column lines. Do not weld bottom chord angles to stabilizer plate unless noted otherwise.
 2. Field weld joists to supporting steel framework in accordance with SJI Standard Specifications for type of joists used. Coordinate welding sequence and procedure with placing of joists.
 3. Bolt joists to supporting steel framework in accordance with SJI Standard Specifications for type of joists used.

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- E. Reinforcement for Concentrated Loads: Reinforcing angles shall be applied for concentrated loads in excess of 150 pounds applied to joists. The reinforcing angles shall transfer the concentrated loads to a joist panel point. Unless noted otherwise, hung elements shall be attached to the joist top chords. Hangers and hanger accessories shall be designed by a Specialty Structural Engineer Registered in the State of Maine (Not the Engineer of Record).
- F. Touch-up painting: Clean field welds, bolted connections, and abraded areas, and apply same type of primer paint as used in shop.

3.02 QUALITY CONTROL:

- A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.
- B. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.
- C. Testing: Owner shall engage an Independent Testing Agency to inspect all puddle welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.
- D. Joist Inspection Requirements (to be performed by the Independent Testing Agency):
- E. Testing:
 - 1. Joist connections, bringing connections and field splices shall be tested as indicated in specification section 05120. Work found to be defective will be removed and replaced at the Contractor's expense.
 - 2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, re-testing will be the Contractor's responsibility.

END OF SECTION