

## SECTION 052100 - STEEL JOIST FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. K-series steel joists.
  - 2. LH- series long-span steel joists
  - 3. Joist girders.
  - 4. Joist accessories.
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
  - 2. Division 04 Section "Unit Masonry" for installing bearing plates in unit masonry.
  - 3. Division 05 Section "Structural Steel" for loose individual or continuous bearing plates and bolts or anchors for such plates.

#### 1.3 DEFINITIONS

- A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated, with deflections no greater than the following:
  - 1. Roof Joists: Vertical live load deflection of 1/360 of the span. Vertical total load deflection of 1/240 of the span.

#### 1.5 SUBMITTALS

- A. General: Submit in accordance with Section 013300.

- B. See Section 013310 for Submittal Schedule.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
  - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.
- B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
  - 1. Finish: Plain, uncoated.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Grade A325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
  - 1. Finish: Plain.
- D. Welding Electrodes: Comply with AWS standards.

### 2.2 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15. Primer paint shall be light grey color unless noted otherwise on the drawings; compatible with finish coats on architecturally exposed joists.

## **2.3 K-SERIES STEEL JOISTS**

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
  - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- D. Holes in Chord Members: Provide holes in chord members where required for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member per AISC Section 1.14.
- E. Extended Ends: Extend bearing ends of joists where indicated, complying with manufacturer's standards and the requirements of applicable SJI "Specifications" and load tables.
- F. Camber joists according to SJI's "Specifications" unless noted otherwise on the drawings.
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

## **2.4 LONG-SPAN STEEL JOISTS**

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
  - 1. Joist Type: LH-series steel joists
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member per AISC Section 1.14.
- D. Camber long-span steel joists according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

## **2.5 JOIST GIRDERS**

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
  - 1. End Arrangement: Underslung with bottom-chord extensions.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member per AISC Section 1.14.
- D. Camber joist girders on the drawings according to SJI's "Specifications" unless noted otherwise on the drawings.
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

## **2.6 JOIST ACCESSORIES**

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Provide bridging anchors for ends of bridging lines terminating at walls or beams. Furnish additional erection bridging if required for stability.
  - 1. For joist girders, provide bottom chord bracing as shown or as required by manufacturer.
- B. Steel bearing plates with integral anchorages are specified in Division 05 Section "Metal Fabrications."
- C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.
- D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

## **2.7 CLEANING AND SHOP PAINTING**

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one shop coat of primer to steel joists and accessories by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 1.0 mil.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Prior to starting erection of steel joists or joist girders, examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
  - 1. Space, adjust, and align joists accurately in location before permanently fastening.
  - 2. Provide minimum bearing requirements specified by SJI.
  - 3. Provide minimum 4" bearing for LH and DLH Series joist and joist girders on steel.
  - 4. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  - 5. Comply with all applicable sections of the latest issuance of OSHA Steel Erection Standard 1926.757, open web steel joists.
- C. Field weld joists to supporting steel bearing plates and steel framing. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
- E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

### **3.3 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a special inspector to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
  - 1. Testing work shall be done under supervision of a registered engineer. After completion of the work of this Section, testing agency shall certify that work conforms to structural drawings. This certification shall bear registered engineer's seal.

- B. Required special inspection and verification as outlined in the applicable building code, including but not limited to:
  - 1. Material verification of high-strength bolts, nuts and washers.
  - 2. Inspection of high strength bolting.
  - 3. Verification of weld filler material.
  - 4. Inspection of welding.
- C. Field welds will be visually inspected according to AWS D1.1/D1.1M.
- D. Bolted connections will be visually inspected.
- E. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

### **3.4 REPAIRS AND PROTECTION**

- A. Touchup Painting for Joists that are to Receive Finish Coat: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
  - 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
  - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- B. Field repair to joists and joist girders must be performed only in accordance with written direction from the joist manufacturer. The contractor shall submit all repair drawings to the Architect and Engineer.
- C. Field modifications to joists and joist girders are not permitted without the written consent from the joist manufacturer. The contractor shall submit all correspondence to the Architect and Engineer.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100