Technical Digest 9:
Handling and Erection of Steel Joists and Joist Girders
Tabs and Highlights

These 1 Exam Prep Tabs are based on the Technical Digest 9: Handling and Erection of Steel Joists and Joist Girders.

Each tabs sheet has five rows of tabs. Start with the first tab at the first row at the top of the page; proceed down that row placing the tabs at the locations listed below. Place each tab in your document, manual, or book setting it down one notch until you get to the last tab. Then start with the highlights.

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***This concludes the tabs for this book. Please continue with the highlights on the following page.***

A.M. 07/17/2020
Glossary:

- Bay
- Bearing
- Bearing Plate
- Bridging
- Camber
- Cantilever
- Chords
- Diagonal Bridging
- End Anchorage
- Erection Bridging
- Joist
- Joist Girder
- Spreader Bar
- Top Chord Extension (TCX)

1. **Ch1. Products:** The steel Joist Institute’s Standard Specification Load Tables and Weight Tables...consist of four joist products: (4 Bullets)

2. The Steel Joist Institute’s Standard Specification for Composite Steel Joists Weight Tables and Bridging Tables consists of one joist product:

   - CJ-Series Composite Joists

   All joists consist of the following basic elements: ...and end bearing seats as illustrated in Figure 1.2.

   **Figure 1.2: Basic Joists Elements, a) Crimped Angle Web; b) Round Bar Web**

   Underslung joists are supported at their ends through...are supported at the ends of the bottom chords.

3. **Figure 1.3: Standard Joist Seats a) Underslung Joists b) Square End Joist**

4. **1. Standard SJI Products**

   **A. Open Web Steel Joists, K-Series:** Depths for Open Web Steel Joists range from 8 inches through 30 inches

   The standard bearing depth is 2 1/2” for the Open Web Steel Joists.

   An example of an Open Web Steel Joist designation is: 18K7 where “18” denotes the nominal joist depth in inches; “K” is the joist series; and “7” is the chord number designation.

   **B. Longspan Joists, LH-Series:** The standard bearing depth for an underslung Longspan Joist is 5 inches.

5. **D. Joist Girders:** Joist Girders are primary structural members that have been designed as simply-supported trusses. They usually bear on columns and support the concentrated loading from the steel joists which run perpendicular to them.

   The standard bearing depth is 7 1/2 inches for underslung Joist Girders.
An example of a Joist Girder designation is: 36G9N6K where “36” denotes the nominal Joist Girder depth at mid-span in inches; “G” indicates that it is a Joist Girder; “9N” denotes that there are 9 joist spacings; and “6K” means that the concentrated load at each panel point or joist location is 6 kips (unfactored) from an Allowable Strength Design.

2. Non-Standard SJI Products

Ch. 3 Tagging and Preparing For Shipment: The information contained on the metal tag includes: 1) through 3).

Joist products are usually shipped upside down.

Loading and Shipping:

- Flat Bed Trailer
- Closed Trailer
- Open Top Trailer

Figure 3.2 Loaded Delivery Truck with Joists in Upside Down Position

Ch. 4 Receiving

Unloading: Joist products are typically unloaded by either crane or forklift. Whenever possible, joist products should be unloaded by bundles.

Additional Unloading Considerations

Job Site Storage of Joist Products: Joist products should be stored in a location that is removed from job site traffic routes. Joists and accessories should be set on proper timbers so that they are free from contact with the ground.

Joists should be stored in the same position in which they are shipped. Joists that are shipped vertically should be stored vertically and joists that are shipped flat should be stored flat.

Joist Girders: On the Joist Placement Plans, Joist Girders are given a mark number for erection placement purposes and that same corresponding number will be found on the tag attached to the girder itself.

In many instances Joist Girders are not loaded symmetrically; consequently, it is imperative that the "Tag End" of a Joist Girder be placed as indicated on the Joist Placement Plans.

Joist Girders must be erected singly. They are to be properly hoisted with attachments placed at top chord panel points…A stabilizer plate is required to be provided on each column. The stabilizer plate must be a minimum of 6 inches by 6 inches and must extend at least 3 inches below the bottom chord of the Joist Girder.

Joist Girders must bear a minimum of 4 inches on steel supports and a minimum of 6 inches on steel plates supported by masonry or concrete…The Joist Placement Plans and the project structural drawings should be checked for specific details or requirements.

Joist Girders directly support the steel joists which bear on them. Typically, joists are placed at top chord panel points of the Joist Girder.
**Column Joists:** The current OSHA safety standard requires that, where columns are not framed in at least two directions with solid structural steel members, joists at column lines shall be field bolted and the joist bottom chord must be restrained by a vertical stabilizer plate (see OSHA 1926.757(a)(1)).

**Short Span – K-Series and KCS:** Proper handling and rigging techniques must be used as previously discussed in Chapter 4. This includes never lifting joist bundles by their strapping and never lifting joists by their webs.

A joist bundle should never be lifted by strapping.

Attachment of the K-Series joist to a Joist Girder or other structural member may be made by either bolting or welding in accordance with current SJI Specifications (see Appendix B, Section 5.6) and the OSHA safety standard (see OSHA 1926.757(a)(8) and (b)(1)).

When K-Series joists are used to provide lateral stability to the supporting member, the final connection shall be made by welding or as designated by the Specifying Professional.

Bridging is a critical component of the steel joist system. Its purpose is to brace the joists against lateral movement during erection and placing of construction loads.

The joist nearest the end of the building should be bridged first, with the ends of the bridging rows being properly anchored.

With respect to horizontal bridging, the amount furnished allows for a minimum lap length of 2 inches to 4 inches, plus an additional percentage more; drops of 3 feet or more should always be used.

**Longspan and Deep Longspan Joists – LH- and DLH-Series**

For Longspan and Deep Longspan Joists, bridging is specified as follows (see Appendix C, Section 104.5):

Hoisting cables shall not be released until the following bolted diagonal bridging is properly installed: (Highlight Table).

After the bridging is installed, the final connections are made on the joist seats. These shall be a minimum of two 1/4 inch fillet welds 2 inches long, or two 3/4 inch diameter bolts or equivalent (see OSHA 1926.757(b)(2)).

When uplift forces are a design consideration, a row of bottom chord bridging is required near each end of the joists (see Appendix C, Section 104.12).

**Composite Steel Joists – CJ-Series**

If the joist end bears on a masonry or concrete support, it must rest on a steel bearing plate, anchored to the masonry unit or concrete, for a minimum distance of 4 inches...it must bear a minimum of 2 1/2 inches at seat depths less than 5 inches and 4 inches at seat depths of 5 inches and greater (see Appendix E, Section 104.4(b)).

On steel joists that do not require erection bridging only one employee shall be allowed on the steel joists unless all bridging is installed and anchored.
The joist nearest the end of the building should be bridged first, with the ends of the bridging rows being properly anchored.

**Erection Bridging**

Where the span of the steel joist is less than 60 feet, the Erection Bridging must be installed as the row of bridging nearest the mid-span of the joist. Where the span of the steel joist is over 60 feet through 100 feet, the required Erection Bridging must be installed as the two rows of bridging nearest the third points of the joist.

As bridging is installed, sweep in the joist should be removed (see Figure 5.11), and vertical misalignment should be corrected (see Figure 5.12).

The vast majority of bridging is welded, horizontal type. This bridging is typically furnished as an angle shape in standard 20 foot lengths.

In erecting bottom bearing (or square ended) joists, it is imperative that they be erected right side up.

**Construction Loads:** **IMPORTANT!** THE OSHA SAFETY STANDARD STRICTLY PROHIBITS PLACING CONSTRUCTION LOADS ON UNBRIDGED JOISTS.

**Inspection Of Joist Products Prior To Erection:** First and foremost, inspect the bridging as follows: 1 - 5.

Proceeding from the bridging, inspect for the following: 1 - 8.

**Ch. 7:** The following steps provide the basic means for panelization: 1 - 8.

Bridging is a component of the steel joist system that braces the joists against lateral displacement during erection (see OSHA 1926.757(d) Erection bridging) and placing of construction loads (see OSHA 1926.757(e) Landing and placing loads).

The number of rows of bridging is dependent on the span of the joist, as well as the size of the top and bottom chords.

When joists span over 60 feet up through 100 feet, all rows of bridging must be bolted diagonal bridging.

The employer needs to be aware that when bolted diagonal erection bridging is required to be installed, the following shall apply (see OSHA 1926.757(d)(6): (5 Bullets)

**Table 8-1 Weld to Provide Minimum 700 lb Nominal Strength for K-Series**

OSHA requires that a bundle of bridging not exceed a total of 1,000 pounds (see Figure 8.3). In addition, the bundle should be placed on a minimum of three joists and within one foot of a secured end as shown in Figure 8.4 (see OSHA 1926.757(e)(3)).

Do not stack bundles of metal decking.

**Camber:** Camber is defined as an arching or curvature. In joists it is exactly this – an upward arching of the chords. The approximate camber for K-, LH- and DLH Series joists and Joist Girders is in accordance with the following table: (Highlight table).
72 & 73

Do the following:

- 21) Restrain and stabilize the ends of all square-end joists.
- 28) Make attachments of the steel deck to the top chord of the joists at a spacing of not more than 36 inches apart and as directed by the deck placement plan.

Don’t do these things: 1 - 12.

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5.3 End Supports

(a) Masonry and Concrete: The ends of K-Series Joists shall extend a distance of not less than 4 inches (102 millimeters) over the masonry or concrete support and be anchored to the steel bearing plate...The plate is to be designed by the specifying professional and shall be furnished by other than the joist manufacturer.

Where it is deemed necessary to bear less than 4 inches (102 millimeters)...The joists must bear a minimum of 2 ½ inches (64 millimeters) on the steel bearing plate.

(b) Steel: Due consideration of the end reactions and all other vertical and lateral forces...The ends of K-Series Joists shall extend a distance of not less than 2 ½ inches (64 millimeters) over the steel supports.

5.4 Bridging

Table 5.4-1

5.6 End Anchorage

5.8 Floor and Roof Decks

5.11 Uplift: A single line of bottom chord bridging must be provided near the first bottom chord panel points whenever uplift due to wind forces is a design consideration.

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Section 6: Erection Stability and Handling

(a) Stability Requirements

(b) Landing and Placing Loads

(c) Field Welding

(d) Handling

(e) Fall Arrest Systems

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104.4 End Supports

(a) Masonry and Concrete: The ends of LH- and DLH Series Joists shall extend a distance of not less than 6 inches (152 millimeters) over the masonry or concrete...and shall be not less 9 inches (229 millimeters) wide perpendicular to the length of the joist.

(b) Steel: The ends of LH or DLH-Series Joists shall extend a distance of not less than 4 inches (102 millimeters) over the steel supports.

104.5 Bridging: Top and bottom chord bridging is required and shall consist of one or both of the following types.
(a) Horizontal

(b) Diagonal

(c) Bridging Lines: For spans up through 60 feet (18288 mm), welded horizontal bridging may be… as indicated by the Red shaded area in the Load Table.

(d) Quantity and Spacing: The maximum spacing of lines of top chord bridging shall not exceed the values in Table 104.5-1.

Table 104.5-1

(e) Connections

(f) Bottom Chord Bearing Joists

104.7 End Anchorage

(a) Masonry and Concrete: Ends of LH- and DLH-Series Joists resting on steel bearing plates on masonry or structural concrete shall be attached thereto with a minimum of two 1/4 inch (6 millimeters) fillet welds 2 inches (51 millimeters) long, or with two 3/4 inch (19 millimeters) ASTM – A307 bolts (minimum), or the equivalent.

104.9 Floor and Roof Decks

(e) Attachments: The spacing of attachments along the top chord shall not exceed 36 inches (914 millimeters). Such attachments of the slab or deck to the top chords of joists shall be capable of resisting the following forces: Highlight Table 104.9-1

Section 105: Erection Stability and Handling

(a) Stability Requirements

Landing and Placing Loads

(c) Field Welding

(d) Handling

(e) Fall Arrest Systems

1004.4 End Supports

(a) Masonry and Concrete

(b) Steel

1004.5 Bracing

1004.6 End Anchorage

104.4 End Supports

(a) Masonry and Concrete
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