STANDARD SPECIFICATIONS
FOR OPEN WEB STEEL JOISTS, K-SERIES

Adopted by the Steel Joist Institute November 4, 1985
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SECTION 1.
SCOPE

This specification covers the design, manufacture and use of Open Web Steel Joists, **K-**Series. Load and Resistance Factor Design (LRFD) and Allowable Strength Design (ASD) are included in this specification.

SECTION 2.
DEFINITION

The term "Open Web Steel Joists **K-**Series," as used herein, refers to open web, parallel chord, load-carrying members suitable for the direct support of floors and roof decks in buildings, utilizing hot-rolled or cold-formed steel, including cold-formed steel whose yield strength* has been attained by cold working. **K-**Series Joists shall be designed in accordance with this specification to support the uniformly distributed loads given in the Standard Load Tables for Open Web Steel Joists, **K-**Series, attached hereto.

The KCS Joist is a **K-**Series Joist which is provided to address the problem faced by specifying professionals when trying to select joists to support uniform plus concentrated loads or other non-uniform loads.

The design of chord sections for **K-**Series Joists shall be based on a yield strength of 50 ksi (345 MPa). The design of web sections for **K-**Series Joists shall be based on a yield strength of either 36 ksi (250 MPa) or 50 ksi (345 MPa). Steel used for **K-**Series Joists chord or web sections shall have a minimum yield strength determined in accordance with one of the procedures specified in Section 3.2, which is equal to the yield strength assumed in the design.

* The term "Yield Strength" as used herein shall designate the yield level of a material as determined by the applicable method outlined in paragraph 13.1 "Yield Point", and in paragraph 13.2 "Yield Strength", of ASTM A370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*, or as specified in paragraph 3.2 of this specification.

SECTION 3.
MATERIALS

3.1 STEEL

The steel used in the manufacture of chord and web sections shall conform to one of the following ASTM Specifications:

- Carbon Structural Steel, ASTM A36/A36M.
- High-Strength, Low-Alloy Structural Steel, ASTM A242/A242M.
- High-Strength Carbon-Manganese Steel of Structural Quality, ASTM A529/A529M, Grade 50.
- High-Strength Low-Alloy Columbium-Vanadium Structural Steel, ASTM A572/A572M, Grade 42 and 50.
- High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 inches (100 mm) Thick, ASTM A588/A588M.
- Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Corrosion Resistance, ASTM A606.
- Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, ASTM A1008/A1008M
- Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, ASTM A1011/A1011M

or shall be of suitable quality ordered or produced to other than the listed specifications, provided that such material in the state used for final assembly and manufacture is weldable and is proved by tests performed by the producer or manufacturer to have the properties specified in Section 3.2.

3.2 MECHANICAL PROPERTIES

The yield strength used as a basis for the design stresses prescribed in Section 4 shall be either 36 ksi (250 MPa) or 50 ksi (345 MPa). Evidence that the steel furnished meets or exceeds the design yield strength shall, if requested, be provided in the form of an affidavit or by witnessed or certified test reports.

For material used without consideration of increase in yield strength resulting from cold forming, the specimens shall be taken from as-rolled material. In the case of material, the mechanical properties of which conform to the requirements of one of the listed specifications, the test specimens and procedures shall conform to those of such specifications and to ASTM A370.

In the case of material, the mechanical properties of which do not conform to the requirements of one of the listed specifications, the test specimens and procedures shall conform to the applicable requirements of ASTM A370, and the specimens shall exhibit a yield strength equal to or exceeding the design yield strength and an elongation of not less than (a) 20 percent in 2 inches (51 millimeters) for sheet and strip, or (b) 18 percent in 8 inches (203 millimeters) for plates, shapes and bars with adjustments for thickness for plates, shapes and bars as prescribed in ASTM A36/A36M, A242/A242M, A529/A529M, A572/A572M, A588/A588M, whichever specification is applicable on the basis of design yield strength.

The number of tests shall be as prescribed in ASTM A6/A6M for plates, shapes, and bars; and ASTM A606, A1008/A1008M and A1011/A1011M for sheet and strip.

If as-formed strength is utilized, the test reports shall show the results of tests performed on full section specimens in accordance with the provisions of the AISI North American Specifications for the Design of Cold-Formed Steel Structural Members. They shall also indicate compliance with these provisions and with the following additional requirements:

a) The yield strength calculated from the test data shall equal or exceed the design yield strength.

b) Where tension tests are made for acceptance and control purposes, the tensile strength shall be at least 6 percent greater than the yield strength of the section.

c) Where compression tests are used for acceptance and control purposes, the specimen shall withstand a gross shortening of 2 percent of its original length without cracking. The length of the specimen shall be not greater than 20 times the least radius of gyration.

d) If any test specimen fails to pass the requirements of the subparagraphs (a), (b), or (c) above, as applicable, two retests shall be made of specimens from the same lot. Failure of one of the retest specimens to meet such requirements shall be the cause for rejection of the lot represented by the specimens.

3.3 PAINT

The standard shop paint is intended to protect the steel for only a short period of exposure in ordinary atmospheric conditions and shall be considered an impermanent and provisional coating.

When specified, the standard shop paint shall conform to one of the following:

a) Steel Structures Painting Council Specification, SSPC No. 15.

b) Or, shall be a shop paint which meets the minimum performance requirements of the above listed specification.

SECTION 4.
DESIGN AND MANUFACTURE

4.1 METHOD

Joists shall be designed in accordance with these specifications as simply supported, uniformly loaded trusses supporting a floor or roof deck so constructed as to brace the top chord of the joists against lateral buckling. Where any applicable design feature is not specifically covered herein, the design shall be in accordance with the following specifications:

a) Where the steel used consists of hot-rolled shapes, bars or plates, use the American Institute of Steel Construction, *Specification for Structural Steel Buildings*.

b) For members that are cold-formed from sheet or strip steel, use the American Iron and Steel Institute, *North American Specification for the Design of Cold-Formed Steel Structural Members*.

Design Basis:

Designs shall be made according to the provisions in this Specification for either Load and Resistance Factor Design (LRFD) or for Allowable Strength Design (ASD).

Load Combinations:

LRFD:

When load combinations are not specified to the joist manufacturer, the required stress shall be computed for the factored loads based on the factors and load combinations as follows:

1.4D

1.2D + 1.6 (L, or L_r, or S, or R)

ASD:

When load combinations are not specified to the joist manufacturer, the required stress shall be computed based on the load combinations as follows:

D

D + (L, or L_r, or S, or R)

Where:

D = dead load due to the weight of the structural elements and the permanent features of the structure

L = live load due to occupancy and movable equipment

L_r = roof live load

S = snow load

R = load due to initial rainwater or ice exclusive of the ponding contribution

When special loads are specified and the specifying professional does not provide the load combinations, the provisions of ASCE 7, *"Minimum Design Loads for Buildings and Other Structures"* shall be used for LRFD and ASD load combinations.

4.2 DESIGN AND ALLOWABLE STRESSES

Design Using Load and Resistance Factor Design (LRFD)

Joists shall have their components so proportioned that the required stresses, f_u, shall not exceed ϕF_n where,

f_u	=	required stress	ksi (MPa)
F_n	=	nominal stress	ksi (MPa)
ϕ	=	resistance factor	
ϕF_n	=	design stress	

Design Using Allowable Strength Design (ASD)

Joists shall have their components so proportioned that the required stresses, f, shall not exceed F_n / Ω where,

f	=	required stress	ksi (MPa)
F_n	=	nominal stress	ksi (MPa)
Ω	=	safety factor	
F_n/Ω	=	allowable stress	

Stresses:

(a) Tension: $\phi_t = 0.90$ (LRFD) $\Omega = 1.67$ (ASD)

For Chords: $F_y = 50$ ksi (345 MPa)

For Webs: $F_y = 50$ ksi (345 MPa), or $F_y = 36$ ksi (250 MPa)

Design Stress = $0.9F_y$ (LRFD) (4.2-1)

Allowable Stress = $0.6F_y$ (ASD) (4.2-2)

(b) Compression: $\phi_c = 0.90$ (LRFD) $\Omega_c = 1.67$ (ASD)

For members with $\frac{\ell}{r} \le 4.71\sqrt{\frac{E}{QF_y}}$

$$F_{cr} = Q\left[0.658^{\left(\frac{QF_y}{F_e}\right)}\right]F_y \qquad (4.2\text{-}3)$$

For members with $\frac{\ell}{r} > 4.71\sqrt{\frac{E}{QF_y}}$

$$F_{cr} = 0.877F_e \qquad (4.2\text{-}4)$$

Where F_e = Elastic buckling stress determined in accordance with Equation 4.2-5.

$$F_e = \frac{\pi^2 E}{\left(\frac{\ell}{r}\right)^2} \qquad (4.2\text{-}5)$$

For hot-rolled sections, "Q" is the full reduction factor for slender compression elements.

Design Stress = $0.9F_{cr}$ (LRFD) (4.2-6)

Allowable Stress = $0.6F_{cr}$ (ASD) (4.2-7)

In the above equations, ℓ is taken as the distance in inches (millimeters) between panel points for the chord members and the appropriate length for web members, and r is the corresponding least radius of gyration of the member or any component thereof. E is equal to 29,000 ksi (200,000 MPa).

Use 1.2 ℓ/r_x for a crimped, first primary compression web member when a moment-resistant weld group is not used for this member; where r_x = member radius of gyration in the plane of the joist.

For cold-formed sections the method of calculating the nominal column strength is given in the AISI, *North American Specification for the Design of Cold-Formed Steel Structural Members.*

(c) Bending: $\phi_b = 0.90$ (LRFD) $\Omega_b = 1.67$ (ASD)

Bending calculations are to be based on using the elastic section modulus.

For chords and web members other than solid rounds:
$F_y = 50$ ksi (345 MPa)

Design Stress = $0.9F_y$ (LRFD) (4.2-8)

Allowable Stress = $0.6F_y$ (ASD) (4.2-9)

For web members of solid round cross section:
$F_y = 50$ ksi (345 MPa), or $F_y = 36$ ksi (250 MPa)

Design Stress = $1.45F_y$ (LRFD) (4.2-10)

Allowable Stress = $0.95F_y$ (ASD) (4.2-11)

For bearing plates:
$F_y = 50$ ksi (345 MPa), or $F_y = 36$ ksi (250 MPa)

Design Stress = $1.35F_y$ (LRFD) (4.2-12)

Allowable Stress = $0.90F_y$ (ASD) (4.2-13)

4.3 MAXIMUM SLENDERNESS RATIOS

The slenderness ratio, ℓ/r, where ℓ is as used in Section 4.2 (b) and r is the corresponding least radius of gyration, shall not exceed the following:

Top chord interior panels	90
Top chord end panels	120
Compression members other than top chord	200
Tension members	240

4.4 MEMBERS

(a) Chords

The bottom chord shall be designed as an axially loaded tension member.

The radius of gyration of the top chord about its vertical axis shall not be less than ℓ/145 where ℓ is the spacing in inches (millimeters) between lines of bridging as specified in Section 5.4(c).

The top chord shall be considered as stayed laterally by the floor slab or roof deck when attachments are in accordance with the requirements of Section 5.8(e) of these specifications.

The top chord shall be designed for only axial compressive stress when the panel length, ℓ, does not exceed 24 inches (609 mm). When the panel length exceeds 24 inches (609 mm), the top chord shall be designed as a continuous member subject to combined axial and bending stresses and shall be so proportioned that:

For LRFD:

at the panel point:

$$f_{au} + f_{bu} \le 0.9F_y \qquad (4.4\text{-}1)$$

at the mid panel: for $\frac{f_{au}}{\phi_c F_{cr}} \ge 0.2$,

$$\frac{f_{au}}{\phi_c F_{cr}} + \frac{8}{9}\left[\frac{C_m f_{bu}}{\left[1-\left(\frac{f_{au}}{\phi_c F_e}\right)\right] Q\phi_b F_y}\right] \le 1.0 \qquad (4.4\text{-}2)$$

for $\frac{f_{au}}{\phi_c F_{cr}} < 0.2$,

$$\left(\frac{f_{au}}{2\phi_c F_{cr}}\right) + \left[\frac{C_m f_{bu}}{\left[1-\left(\frac{f_{au}}{\phi_c F_e}\right)\right] Q\phi_b F_y}\right] \le 1.0 \qquad (4.4\text{-}3)$$

$f_{au} = P_u/A$ = Required compressive stress, ksi (MPa)

P_u = Required axial strength using LRFD load combinations, kips (N)

$f_{bu} = M_u/S$ = Required bending stress at the location under consideration, ksi (MPa)

M_u = Required flexural strength using LRFD load combinations, kip-in. (N-mm)

S = Elastic Section Modulus, in.^{3} (mm^3)

F_{cr} = Nominal axial compressive stress in ksi (MPa) based on ℓ/ r as defined in Section 4.2(b),

$C_m = 1 - 0.3\, f_{au}/\phi F_e$ for end panels

$C_m = 1 - 0.4\, f_{au}/\phi F_e$ for interior panels

F_y = Specified minimum yield strength, ksi (MPa)

$F_e = \dfrac{\pi^2 E}{\left(\ell / r_x\right)^2}$, ksi (MPa)

Where ℓ is the panel length, in inches (millimeters), as defined in Section 4.2(b) and r_x is the radius of gyration about the axis of bending.

Q = Form factor defined in Section 4.2(b)

A = Area of the top chord, in.^{2} (mm^2)

For ASD:

at the panel point:

$$f_a + f_b \le 0.6F_y \qquad (4.4\text{-}4)$$

at the mid panel: for $\frac{f_a}{F_a} \ge 0.2$,

$$\frac{f_a}{F_a} + \frac{8}{9}\left[\frac{C_m f_b}{\left[1-\left(\frac{1.67 f_a}{F_e}\right)\right] QF_b}\right] \le 1.0 \qquad (4.4\text{-}5)$$

for $\frac{f_a}{F_a} < 0.2$,

$$\left(\frac{f_a}{2F_a}\right) + \left[\frac{C_m f_b}{\left[1-\left(\frac{1.67 f_a}{F_e}\right)\right] QF_b}\right] \le 1.0 \qquad (4.4\text{-}6)$$

f_a = P/A = Required compressive stress, ksi (MPa)

P = Required axial strength using ASD load combinations, kips (N)

f_b = M/S = Required bending stress at the location under consideration, ksi (MPa)

M = Required flexural strength using ASD load combinations, kip-in. (N-mm)

S = Elastic Section Modulus, in.^{3} (mm^3)

F_a = Allowable axial compressive stress based on ℓ/r as defined in Section 4.2(b), ksi (MPa)

F_b = Allowable bending stress; $0.6F_y$, ksi (MPa)

$C_m = 1 - 0.50\, f_a/F_e$ for end panels

$C_m = 1 - 0.67\, f_a/F_e$ for interior panels

(b) Web

The vertical shears to be used in the design of the web members shall be determined from full uniform loading, but such vertical shears shall be not less than 25 percent of the end reaction. Due consideration shall be given to the effect of eccentricity. The effect of combined axial compression and bending may be investigated using the provisions of Section 4.4(a), letting $C_m = 0.4$ when bending due to eccentricity produces reversed curvature.

Interior vertical web members used in modified Warren type web systems shall be designed to resist the gravity loads supported by the member plus an additional axial load of 1/2 of 1.0 percent of the top chord axial force.

(c) Extended Ends

The magnitude and location of the loads to be supported, deflection requirements, and proper bracing of extended

top chords or full depth cantilever ends shall be clearly indicated on the structural drawings.

4.5 CONNECTIONS

(a) Methods

Joist connections and splices shall be made by attaching the members to one another by arc or resistance welding or other accredited methods.

(1) Welded Connections

a) Selected welds shall be inspected visually by the manufacturer. Prior to this inspection, weld slag shall be removed.

b) Cracks are not acceptable and shall be repaired.

c) Thorough fusion shall exist between weld and base metal for the required design length of the weld; such fusion shall be verified by visual inspection.

d) Unfilled weld craters shall not be included in the design length of the weld.

e) Undercut shall not exceed 1/16 inch (2 millimeters) for welds oriented parallel to the principal stress.

f) The sum of surface (piping) porosity diameters shall not exceed 1/16 inch (2 millimeters) in any 1 inch (25 millimeters) of design weld length.

g) Weld spatter that does not interfere with paint coverage is acceptable.

(2) Welding Program

Manufacturers shall have a program for establishing weld procedures and operator qualification, and for weld sampling and testing. (See Technical Digest #8 - Welding of Open Web Steel Joists.)

(3) Weld Inspection by Outside Agencies (See Section 5.12 of these specifications)

The agency shall arrange for visual inspection to determine that welds meet the acceptance standards of Section 4.5(a)(1) above. Ultrasonic, X-Ray, and magnetic particle testing are inappropriate for joists due to the configurations of the components and welds.

(b) Strength

(1) Joint Connections - Joint connections shall be capable of withstanding forces due to an ultimate load equal to at least 1.35 times the LRFD, or 2.0 times the ASD load shown in the applicable Standard Load Table.

(2) Shop Splices – Splices may occur at any point in chord or web members. Members containing a butt weld splice shall develop an ultimate tensile force of at least 57 ksi (393 MPa) times the full design area of the chord or web. The term “member” shall be defined as all component parts comprising the chord or web, at the point of the splice.

(c) Eccentricity

Members connected at a joint shall have their centroidal axes meet at a point if practical. Otherwise, due consideration shall be given to the effect of eccentricity. In no case shall eccentricity of any web member at a joint exceed 3/4 of the over-all dimension, measured in the plane of the web, of the largest member connected. The eccentricity of any web member shall be the perpendicular distance from the centroidal axis of that web member to the point on the centroidal axis of the chord which is vertically above or below the intersection of the centroidal axes of the web members forming the joint. Ends of joists shall be proportioned to resist bending produced by eccentricity at the support.

4.6 CAMBER

Joists shall have approximate camber in accordance with the following:

TABLE 4.6-1

Top Chord Length		Approximate Camber	
20'-0"	(6096 mm)	1/4"	(6 mm)
30'-0"	(9144 mm)	3/8"	(10 mm)
40'-0"	(12192 mm)	5/8"	(16 mm)
50'-0"	(15240 mm)	1"	(25 mm)
60'-0"	(18288 mm)	1 1/2"	(38 mm)

The specifying professional shall give consideration to coordinating joist camber with adjacent framing.

4.7 VERIFICATION OF DESIGN AND MANUFACTURE

(a) Design Calculations

Companies manufacturing **K-**Series Joists shall submit design data to the Steel Joist Institute (or an independent agency approved by the Steel Joist Institute) for verification of compliance with the SJI Specifications. Design data shall be submitted in detail and in the format specified by the Institute.

(b) Tests of Chord and Web Members

Each manufacturer shall, at the time of design review by the Steel Joist Institute or other independent agency, verify by tests that the design, in accordance with Sections 4.1 through 4.5 of this specification, will provide the theoretical strength of critical members. Such tests shall be evaluated considering the actual yield strength of the members of the test joists.

Material tests for determining mechanical properties of component members shall be conducted.

(c) Tests of Joints and Connections

Each manufacturer shall verify by shear tests on representative joints of typical joists that connections will meet the provision of Section 4.5(b). Chord and web members may be reinforced for such tests.

(d) In-Plant Inspections

Each manufacturer shall verify their ability to manufacture **K-**Series Joists through periodic In-Plant Inspections. Inspections shall be performed by an independent agency approved by the Steel Joist Institute. The frequency, manner of inspection, and manner of reporting shall be determined by the Steel Joist Institute. The plant inspections are not a guarantee of the quality of any specific joists; this responsibility lies fully and solely with the individual manufacturer.

SECTION 5. APPLICATION

5.1 USAGE

These specifications shall apply to any type of structure where floors and roofs are to be supported directly by steel joists installed as hereinafter specified. Where joists are used other than on simple spans under uniformly distributed loading as prescribed in Section 4.1, they shall be investigated and modified if necessary to limit the required stresses to those listed in Section 4.2.

CAUTION: If a rigid connection of the bottom chord is to be made to the column or other support, it shall be made only after the application of the dead loads. The joist is then no longer simply supported, and the system must be investigated for continuous frame action by the specifying professional.

The designed detail of a rigid type connection and moment plates shall be shown on the structural drawings by the specifying professional. The moment plates shall be furnished by other than the joist manufacturer.

5.2 SPAN

The span of a joist shall not exceed 24 times its depth.

5.3 END SUPPORTS

(a) Masonry and Concrete

K-Series Joists supported by masonry or concrete are to bear on steel bearing plates and shall be designed as steel bearing. Due consideration of the end reactions and all other vertical or lateral forces shall be taken by the specifying professional in the design of the steel bearing plate and the masonry or 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 shall be located not more than 1/2 inch (13 millimeters) from the face of the wall and shall be not less than 6 inches (152 millimeters) wide perpendicular to the length of the joist. 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) over the masonry or concrete support, special consideration is to be given to the design of the steel bearing plate and the masonry or concrete by the specifying professional. The joists must bear a minimum of 2 1/2 inches (64 millimeters) on the steel bearing plate.

(b) Steel

Due consideration of the end reactions and all other vertical and lateral forces shall be taken by the specifying professional in the design of the steel support. The ends of **K-**Series Joists shall extend a distance of not less than 2 1/2 inches (64 millimeters) over the steel supports.

5.4 BRIDGING

Top and bottom chord bridging is required and shall consist of one or both of the following types.

(a) Horizontal

Horizontal bridging shall consist of continuous horizontal steel members. Attachments to the joist chords shall be made by welding or mechanical means and shall be capable of resisting a nominal (unfactored) horizontal force of not less than 700 pounds (3114 Newtons).

The ratio of unbraced length to least radius of gyration, ℓ/r, of the bridging member shall not exceed 300, where ℓ is the distance in inches (millimeters) between attachments and r is the least radius of gyration of the bridging member.

(b) Diagonal

Diagonal bridging shall consist of cross-bracing with a ℓ/r ratio of not more than 200, where ℓ is the distance in inches (millimeters) between connections and r is the least radius of gyration of the bracing member. Where cross-bracing members are connected at their point of intersection, the ℓ distance shall be taken as the distance in inches (millimeters) between connections at the point of intersection of the bracing members and the connections to the chord of the joists. Connections to the chords of steel joists shall be made by positive mechanical means or by welding.

(c) Quantity and Spacing

The number of rows of top chord bridging shall not be less than as shown in Bridging Tables 5.4-1 and the spacing shall meet the requirements of Section 4.4(a). The number of rows of bottom chord bridging, including bridging required per Section 5.11, shall not be less than the number of top chord rows. Rows of bottom chord bridging are permitted to be spaced independently of rows of top chord bridging. The spacing of rows of bottom chord bridging shall meet the slenderness requirement of Section 4.3 and any specified strength requirements.

(d) Bottom Chord Bearing Joists

Where bottom chord bearing joists are utilized, a row of diagonal bridging shall be provided near the support(s). This bridging shall be installed and anchored before the hoisting cable(s) is released.

TABLE 5.4-1

NUMBER OF ROWS OF TOP CHORD BRIDGING**

Refer to the **K-**Series Load Table and Specification Section 6 for required bolted diagonal bridging.
Distances are Joist Span lengths in feet - See "Definition of Span" preceding Load Table.

*Section Number	One Row	Two Rows	Three Rows	Four Rows	Five Rows
#1	Up thru 16	Over 16 thru 24	Over 24 thru 28		
#2	Up thru 17	Over 17 thru 25	Over 25 thru 32		
#3	Up thru 18	Over 18 thru 28	Over 28 thru 38	Over 38 thru 40	
#4	Up thru 19	Over 19 thru 28	Over 28 thru 38	Over 38 thru 48	
#5	Up thru 19	Over 19 thru 29	Over 29 thru 39	Over 39 thru 50	Over 50 thru 52
#6	Up thru 19	Over 19 thru 29	Over 29 thru 39	Over 39 thru 51	Over 51 thru 56
#7	Up thru 20	Over 20 thru 33	Over 33 thru 45	Over 45 thru 58	Over 58 thru 60
#8	Up thru 20	Over 20 thru 33	Over 33 thru 45	Over 45 thru 58	Over 58 thru 60
#9	Up thru 20	Over 20 thru 33	Over 33 thru 46	Over 46 thru 59	Over 59 thru 60
#10	Up thru 20	Over 20 thru 37	Over 37 thru 51	Over 51 thru 60	
#11	Up thru 20	Over 20 thru 38	Over 38 thru 53	Over 53 thru 60	
#12	Up thru 20	Over 20 thru 39	Over 39 thru 53	Over 53 thru 60	

* Last digit(s) of joist designation shown in Load Table
** See Section 5.11 for additional bridging required for uplift design.

5.5 INSTALLATION OF BRIDGING

Bridging shall support the top and bottom chords against lateral movement during the construction period and shall hold the steel joists in the approximate position as shown on the joist placement plans.

The ends of all bridging lines terminating at walls or beams shall be anchored thereto.

5.6 END ANCHORAGE

(a) Masonry and Concrete

Ends of **K-**Series Joists resting on steel bearing plates on masonry or structural concrete shall be attached thereto with a minimum of two 1/8 inch (3 millimeters) fillet welds 1 inch (25 millimeters) long, or with two 1/2 inch (13 millimeters) ASTM A307 bolts, or the equivalent.

(b) Steel

Ends of **K-**Series Joists resting on steel supports shall be attached thereto with a minimum of two 1/8 inch (3 millimeters) fillet welds 1 inch (25 millimeters) long, or with two 1/2 inch (13 millimeters) ASTM A307 bolts, or the equivalent. 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.

(c) Uplift

Where uplift forces are a design consideration, roof joists shall be anchored to resist such forces (Refer to Section 5.11 Uplift).

5.7 JOIST SPACING

Joists shall be spaced so that the loading on each joist does not exceed the design load (LRFD or ASD) for the particular joist designation and span as shown in the applicable load tables.

5.8 FLOOR AND ROOF DECKS

(a) Material

Floor and roof decks may consist of cast-in-place or precast concrete or gypsum, formed steel, wood, or other suitable material capable of supporting the required load at the specified joist spacing.

(b) Thickness

Cast-in-place slabs shall be not less than 2 inches (51 millimeters) thick.

(c) Centering

Centering for cast-in-place slabs may be ribbed metal lath, corrugated steel sheets, paper-backed welded wire fabric, removable centering or any other suitable material capable of supporting the slab at the designated joist spacing. Centering shall not cause lateral displacement or damage to the top chord of joists during installation or removal of the centering or placing of the concrete.

(d) Bearing

Slabs or decks shall bear uniformly along the top chords of the joists.

(e) Attachments

The spacing for slab or deck attachments along the joist top chord shall not exceed 36 inches (914 millimeters), and shall be capable of resisting a nominal (unfactored) lateral force of not less than 300 pounds (1335 Newtons), i.e., 100 plf (1.46 kN/m).

(f) Wood Nailers

Where wood nailers are used, such nailers in conjunction with deck or slab shall be attached to the top chords of the joists in conformance with Section 5.8(e).

(g) Joist With Standing Seam Roofing

The stiffness and strength of standing-seam roof clips varies from one manufacturer to another. Therefore, some roof systems cannot be counted on to provide lateral stability to the joists which support the roof. Sufficient stability must be provided to brace the joists laterally under the full design load. The compression chord must resist the chord axial design force in the plane of the joist (i.e., x-x axis buckling) and out of the plane of the joist (i.e., y-y axis buckling). Out-of-plane strength may be achieved by adjusting the bridging spacing and/or increasing the compression chord area, the joist depth, and the y-axis radius of gyration. The effective slenderness ratio in the y-direction equals 0.94 L/r_y; where L is the bridging spacing in inches (millimeters). The maximum bridging spacing may not exceed that specified in Section 5.4(c).

Horizontal bridging members attached to the compression chords and their anchorage's must be designed for a compressive axial force of 0.0025nP, where n is the number of joists between end anchors and P is the chord design force in kips (Newtons). The attachment force between the horizontal bridging member and the compression chord is 0.005P. Horizontal bridging attached to the tension chords shall be proportioned so that the slenderness ratio between attachments does not exceed 300. Diagonal bridging shall be proportioned so that the slenderness ratio between attachments does not exceed 200.

5.9 DEFLECTION

The deflection due to the design nominal live load shall not exceed the following:

Floors: 1/360 of span.

Roofs: 1/360 of span where a plaster ceiling is attached or suspended.
1/240 of span for all other cases.

The specifying professional shall give consideration to the effects of deflection and vibration* in the selection of joists.

* For further reference, refer to Steel Joist Institute Technical Digest #5, "Vibration of Steel Joist-Concrete Slab Floors" and the Institute's Computer Vibration Program.

5.10 PONDING*

The ponding investigation shall be performed by the specifying professional.

* For further reference, refer to Steel Joist Institute Technical Digest #3, "Structural Design of Steel Joist Roofs to Resist Ponding Loads" and AISC Specifications.

5.11 UPLIFT

Where uplift forces due to wind are a design requirement, these forces must be indicated on the contract drawings in terms of NET uplift in pounds per square foot (Pascals). The contract documents shall indicate if the net uplift is based upon LRFD or ASD. When these forces are specified, they must be considered in the design of joists and/or bridging. 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.*

* For further reference, refer to Steel Joist Institute Technical Digest #6, "Structural Design of Steel Joist Roofs to Resist Uplift Loads".

5.12 INSPECTION

Joists shall be inspected by the manufacturer before shipment to verify compliance of materials and workmanship with the requirements of these specifications. If the purchaser wishes an inspection of the steel joists by someone other than the manufacturer's own inspectors, they may reserve the right to do so in their "Invitation to Bid" or the accompanying "Job Specifications".

Arrangements shall be made with the manufacturer for such inspection of the joists at the manufacturing shop by the purchaser's inspectors at purchaser's expense.

5.13 PARALLEL CHORD SLOPED JOISTS

The span of a parallel chord sloped joist shall be defined by the length along the slope. Minimum depth, load-carrying capacity, and bridging requirements shall be determined by the sloped definition of span. The Standard Load Table capacity shall be the component normal to the joist.

SECTION 6.*
ERECTION STABILITY AND HANDLING

When it is necessary for the erector to climb on the joists, extreme caution must be exercised since unbridged joists may exhibit some degree of instability under the erector's weight.

(a) Stability Requirements

1) Before an employee is allowed on the steel joist: BOTH ends of joists at columns (or joists designated as column joists) shall be attached to its supports. For all other joists a minimum of one end shall be attached before the employee is allowed on the joist. The attachment shall be in accordance with Section 5.6 – End Anchorage.

   When a bolted seat connection is used for erection purposes, as a minimum, the bolts must be snug tightened. The snug tight condition is defined as the tightness that exists when all plies of a joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of an employee using an ordinary spud wrench.

2) On steel joists that do not require erection bridging as shown by the unshaded area of the Load Tables, only one employee shall be allowed on the steel joist unless all bridging is installed and anchored.

   * For a thorough coverage of this topic, refer to SJI Technical Digest #9, "Handling and Erection of Steel Joists and Joist Girders".

3) Where the span of the steel joist is within the Red shaded area of the Load Table, the following shall apply:

   a) The row of bridging nearest the mid span of the steel joists shall be bolted diagonal erection bridging; and

   b) Hoisting cables shall not be released until this bolted diagonal erection bridging is installed and anchored, unless an alternate method of stabilizing the joist has been provided; and

   c) No more than one employee shall be allowed on these spans until all other bridging is installed and anchored.

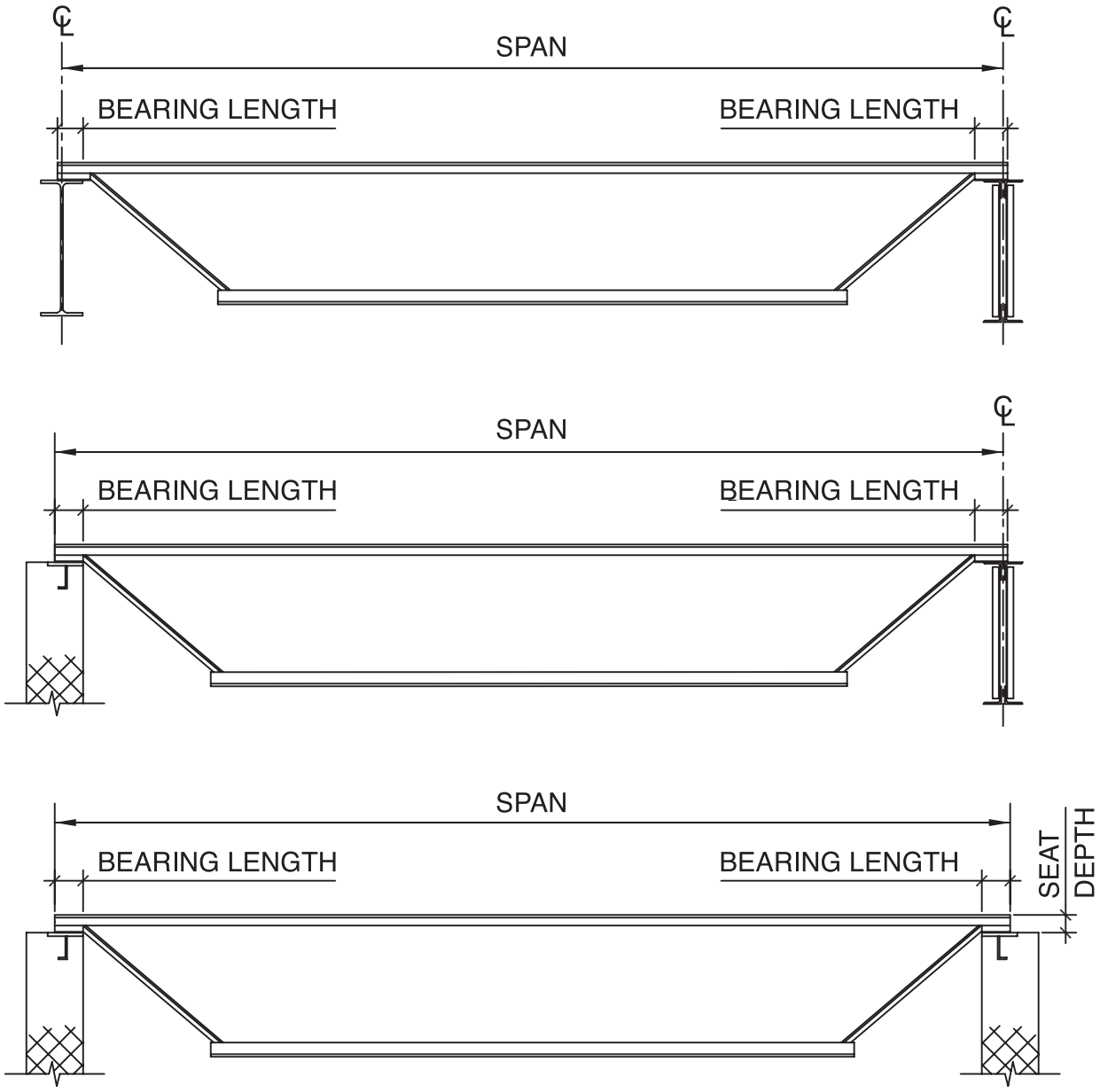
4) When permanent bridging terminus points cannot be used during erection, additional temporary bridging terminus points are required to provide stability.

5) In the case of bottom chord bearing joists, the ends of the joist must be restrained laterally per Section 5.4(d).

6) After the joist is straightened and plumbed, and all bridging is completely installed and anchored, the ends of the joists shall be fully connected to the supports in accordance with Section 5.6 End Anchorage.

DEFINITION OF SPAN

(U. S. Customary Units)



NOTES: 1) DESIGN LENGTH = SPAN - 0.33 FT.

2) BEARING LENGTH FOR STEEL SUPPORTS SHALL NOT BE LESS THAN 2 1/2 INCHES; FOR MASONRY AND CONCRETE NOT LESS THAN 4 INCHES.

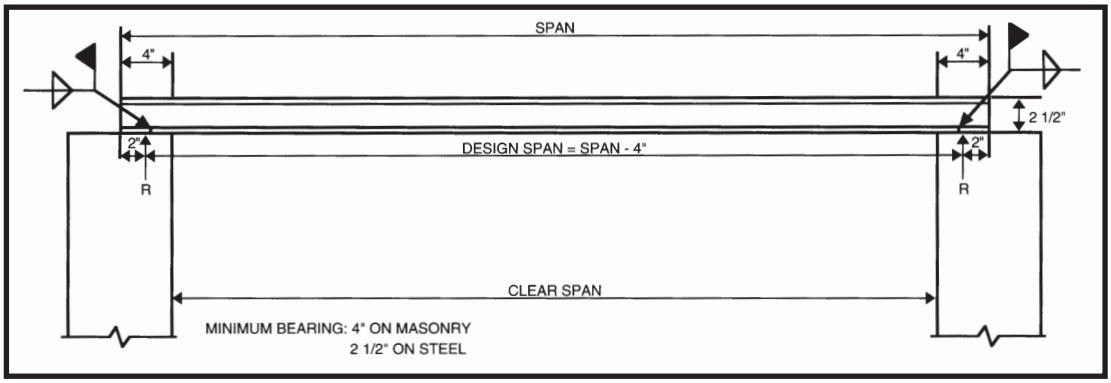
3) PARALLEL CHORD JOISTS INSTALLED TO A SLOPE GREATER THAN 1/2 INCH PER FOOT SHALL USE SPAN DEFINED BY THE LENGTH ALONG THE SLOPE.

FABRICATION

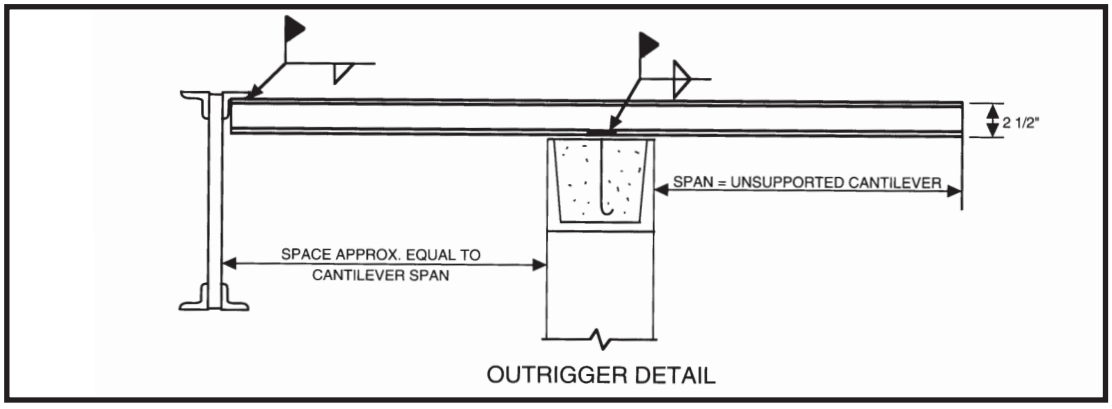
- Depth 2.5 in
- Maximum Length 10 ft
- Minimum Length 3 ft
- Contact your local Vulcraft plant for sloped or pitched seat information.

2.5K SERIES SIMPLE SPAN INFORMATION

2.5K TYPE	2.5K1	2.5K2	2.5K3
S in^3	0.62	0.84	1.2
I in^4	0.78	1.1	1.5
WT lbs/ft	3.0	4.2	6.4



NOTE: 2.5K SERIES NOT U.L. APPROVED.



NOTE: 2.5K SERIES NOT U.L. APPROVED.

LRFD

LOAD TABLE FOR LOOSE OUTRIGGERS

OUTRIGGER TYPE	TOTAL ALLOWABLE LOAD FOR UNSUPPORTED CANTILEVER PLF* SPAN ft-in									
	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"
2.5K1	825	749	519	381	293	231	188	155	—	—
2.5K2	825	825	698	512	392	311	251	207	174	—
2.5K3	825	825	825	740	566	447	362	299	252	215

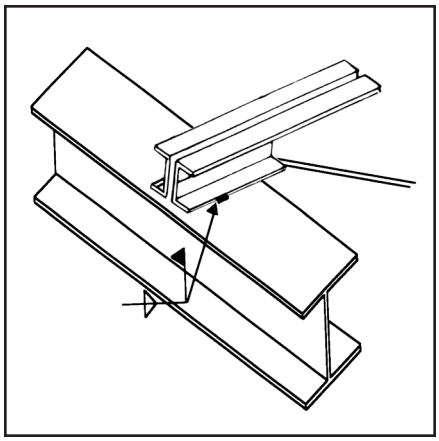
ASD

LOAD TABLE FOR LOOSE OUTRIGGERS

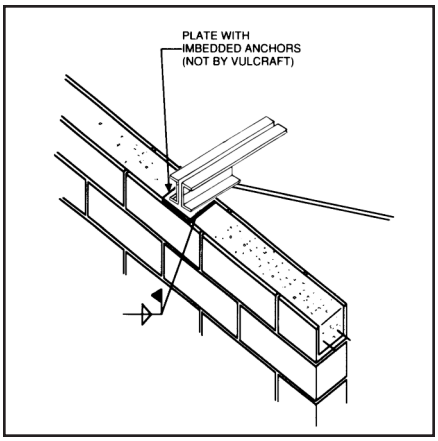
OUTRIGGER TYPE	TOTAL ALLOWABLE LOAD FOR UNSUPPORTED CANTILEVER PLF* SPAN ft-in									
	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"
2.5K1	550	499	346	254	195	154	125	103	—	—
2.5K2	550	550	465	341	261	207	167	138	116	—
2.5K3	550	550	550	493	377	298	241	199	168	143

*Serviceability requirements must be checked by the specifying professional.

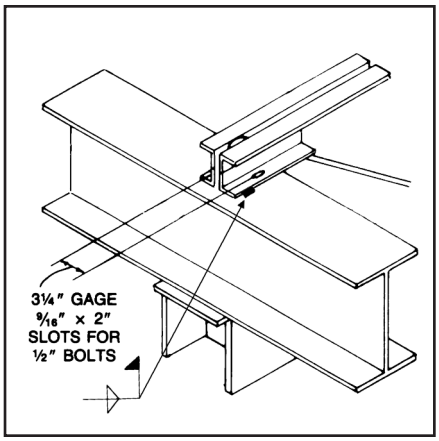
K SERIES OPEN WEB STEEL JOISTS



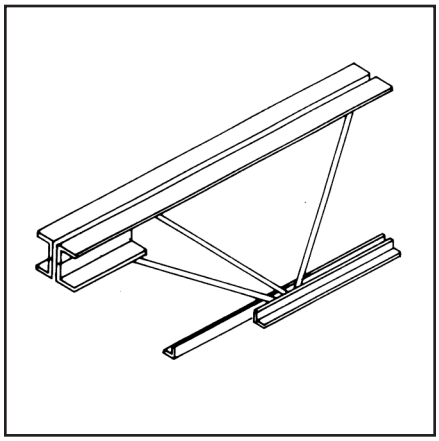
ANCHORAGE TO STEEL
SEE SJI SPECIFICATION 5.3 (b) AND 5.6



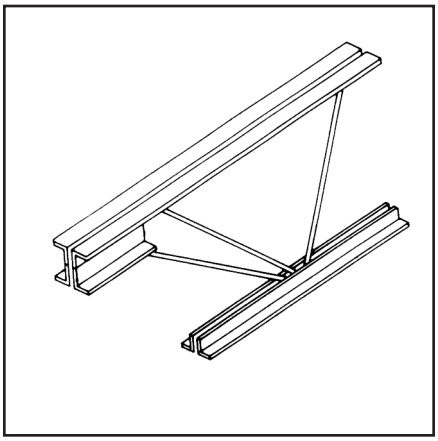
ANCHORAGE TO MASONARY
SEE SJI SPECIFICATION 5.3 (a) AND 5.6



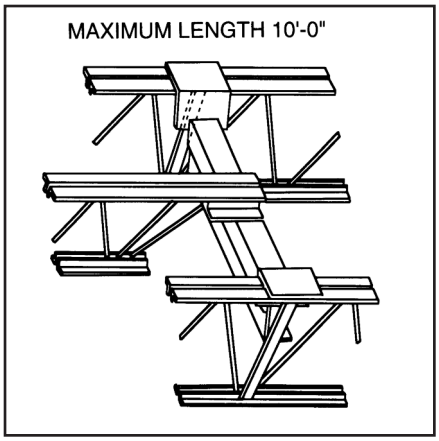
BOLTED CONNECTION*
TYPICALLY REQUIRED AT COLUMNS



CEILING EXTENSION



BOTTOM CHORD STRUT



HEADERS
Note: If header does not bear at a Joist Panel Point add extra web in field as shown.
EW or Panel Point by Vulcraft

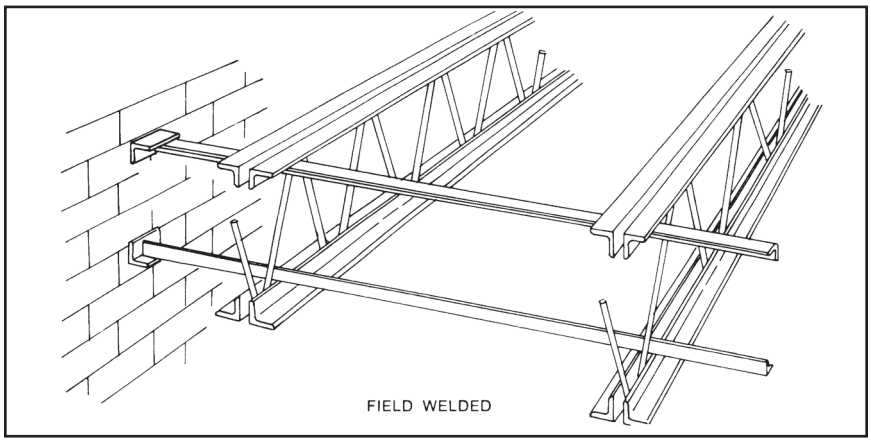
MAXIMUM DUCT OPENING SIZES (K SERIES)*

JOIST DEPTH	ROUND	SQUARE	RECTANGLE
8 inches	5 inches	4x4 inches	3x8 inches
10 inches	6 inches	5x5 inches	3x8 inches
12 inches	7 inches	6x6 inches	4x9 inches
14 inches	8 inches	6x6 inches	5x9 inches
16 inches	9 inches	7 1/2x 71/2 inches	6X10 inches
18 inches	11 inches	8x8 inches	7x11 inches
20 inches	11 inches	9x9 inches	7x12 inches
22 inches	12 inches	9 1/2 x9 1/2 inches	8x12 inches
24 inches	13 inches	10x10 inches	8x13 inches
26 inches	151/2 inches	12x12 inches	9x18 inches
28 inches	16 inches	13x13 inches	9x18 inches
30 inches	17 inches	14x14 inches	10x18 inches
***FOR LH SERIES CONSULT WITH VULCRAFT**			

SPECIFYING PROFESSIONAL MUST INDICATE ON STRUCTURAL DRAWINGS SIZE AND LOCATION OF ANY DUCT THAT IS TO PASS THRU JOIST.

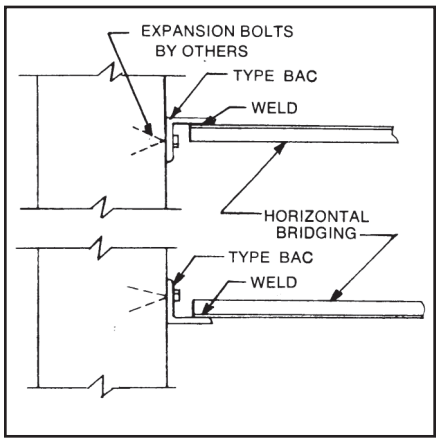
SEE SJI SPECIFICATION - SECTION 6. FOR HANDLING AND ERECTION OF K-SERIES OPEN WEB STEEL JOISTS AND SJI TECHNICAL DIGEST NO. 9.

K SERIES OPEN WEB STEEL JOISTS

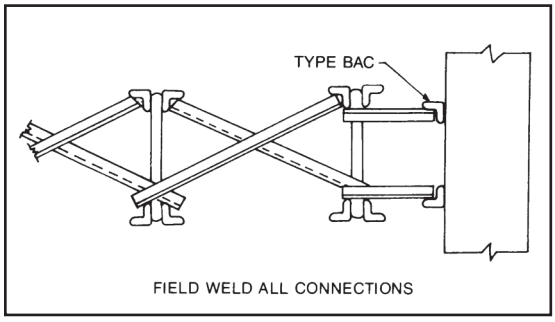


HORIZONTAL BRIDGING
SEE SJI SPECIFICATION 5.5 AND 6.

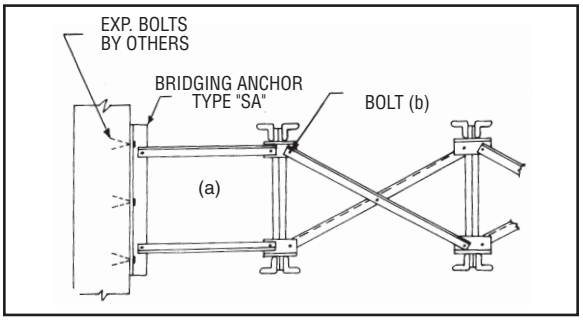
NOTE: DO NOT WELD BRIDGING TO JOIST WEB MEMBERS.
DO NOT HANG ANY MECHANICAL, ELECTRICAL, ETC. FROM BRIDGING.



BRIDGING ANCHORS
SEE SJI SPECIFICATION 5.5 AND 6.



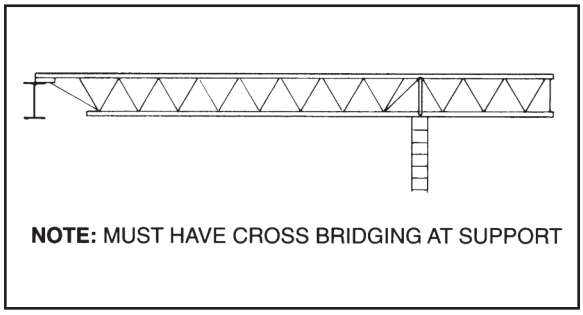
WELDED CROSS BRIDGING
SEE SJI SPECIFICATION 5.5 AND 6.
HORIZONTAL BRIDGING SHALL BE USED IN SPACE ADJACENT TO THE WALL TO ALLOW FOR PROPER DEFLECTION OF THE JOIST NEAREST THE WALL.



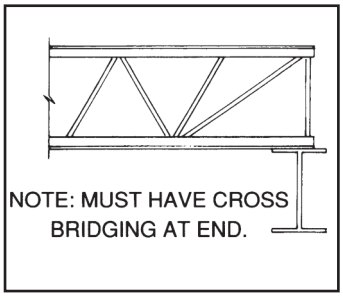
BOLTED CROSS BRIDGING
SEE SJI SPECIFICATION 5.5 AND 6.

(a) Horizontal Bridging units shall be used in the space adjacent to the wall to allow for proper deflection of the joist nearest the wall.

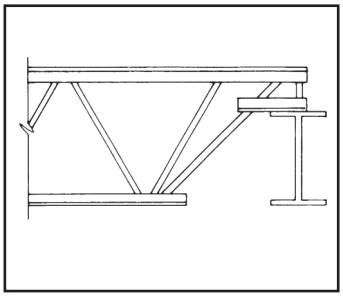
(b) For required bolt size refer to bridging table on page 136.
NOTE: Clip configuration may vary from that shown.



FULL DEPTH CANTILEVER END
SEE SJI SPECIFICATION 5.4 (d) AND 5.5 FOR BRIDGING REQUIREMENTS.



SQUARE END
SEE SJI SPECIFICATION 5.4 (d)
AND 5.5 FOR BRIDGING
REQUIREMENTS.



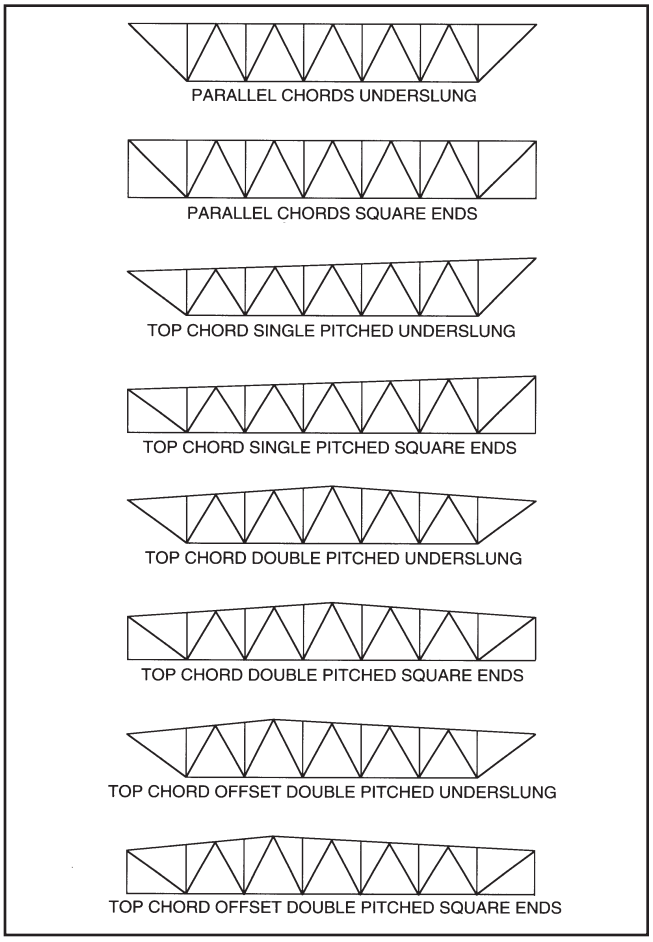
DEEP BEARINGS
CONFIGURATION MAY VARY

STANDARD TYPES

Longspan steel joists can be furnished with either underslung or square ends, with parallel chords or with single or double pitched top chords to provide sufficient slope for roof drainage.

The Longspan joist designation is determined by its nominal depth at the center of the span, except for offset double pitched joists, where the depth should be given at the ridge. A part of the designation should be either the section number or the total design load over the design live load (TL/LL given in plf).

All pitched joists will be cambered in addition to the pitch unless specified otherwise.



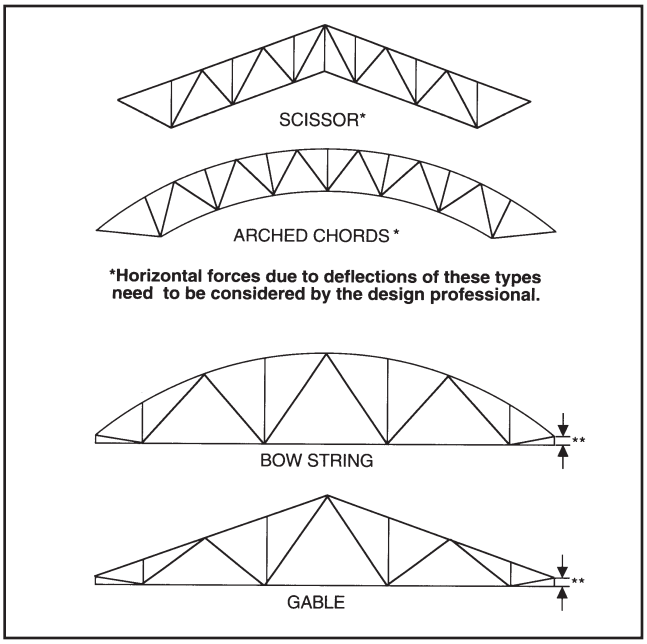
CAMBER

Non-Standard Types: The design professional shall provide on the structural drawings the amount of camber desired in inches. If camber is not specified, Vulcraft will use the camber values for LH and DLH joists based on top chord length.

Standard Types: The camber listed in the table will be fabricated into the joists unless the design professional specifically states otherwise on the structural drawings.

NON-STANDARD TYPES

The following joists can also be supplied by Vulcraft, however, **THE DISTRICT SALES OFFICE OR MANUFACTURING FACILITY NEAREST YOU SHOULD BE CONTACTED FOR ANY LIMITATIONS IN DEPTH OR LENGTH.**



**Contact Vulcraft for minimum depth at ends.

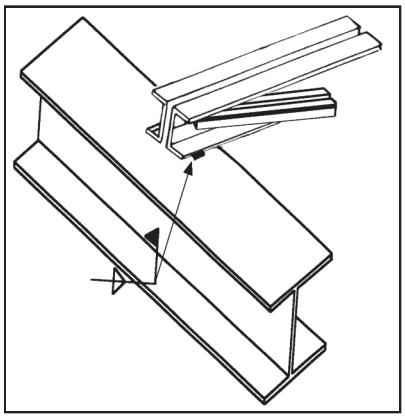
CAMBER FOR STANDARD TYPES

LH &DLH series joists shall have camber in accordance with the following table:***

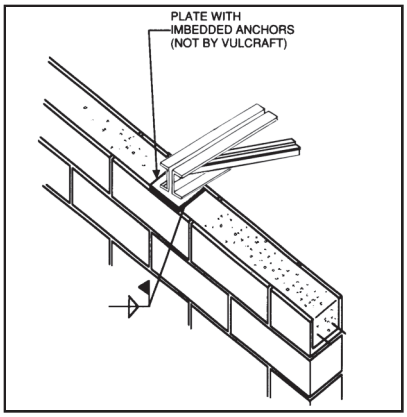
Top Chord Length		Approx. Camber	
20'-0"	(6096 mm)	1/4"	(6 mm)
30'-0"	(9144 mm)	3/8"	(10 mm)
40'-0"	(12192 mm)	5/8"	(16 mm)
50'-0"	(15240 mm)	1"	(25 mm)
60'-0"	(18288 mm)	1 1/2"	(38 mm)
70'-0"	(21336 mm)	2"	(51 mm)
80'-0"	(24384 mm)	2 3/4"	(70 mm)
90'-0"	(27432 mm)	3 1/2"	(89 mm)
100'-0"	(30480 mm)	4 1/4"	(108 mm)
110'-0"	(33528 mm)	5"	(127 mm)
120'-0"	(36576 mm)	6"	(152 mm)
130'-0"	(39621 mm)	7"	(178 mm)
140'-0"	(42672 mm)	8"	(203 mm)
144'-0"	(43890 mm)	8 1/2"	(216 mm)

*** NOTE: If full camber is not desired near walls or other structural members please note on the structural drawings.

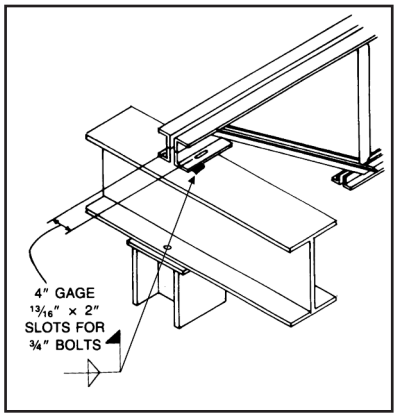
LH & DLH SERIES LONGSPAN STEEL JOISTS



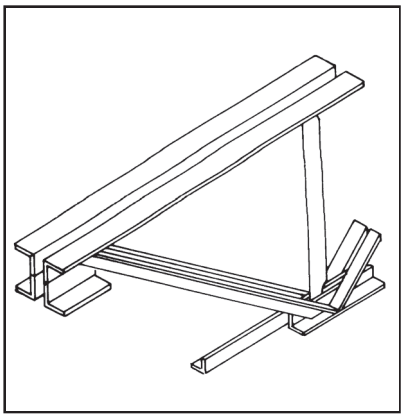
ANCHORAGE TO STEEL
SEE SJI SPECIFICATION
104.4 (b) AND 104.7 (b)



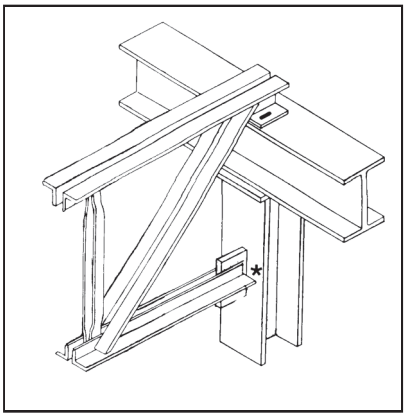
ANCHORAGE TO MASONRY
SEE SJI SPECIFICATION
104.4 (a) AND 104.7 (a)



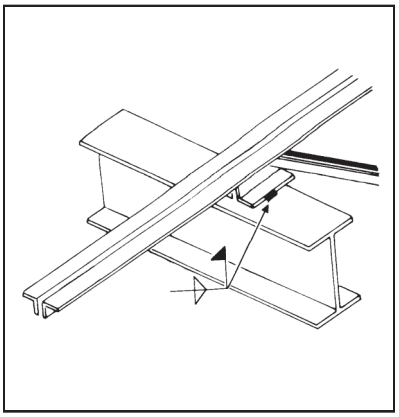
BOLTED CONNECTION
See Note (c)
Typically required at columns



CEILING EXTENSION



BOTTOM CHORD EXTENSION
*If bottom chord extension is to be bolted or welded the specifiying professional must provide axial loads on structural drawings.



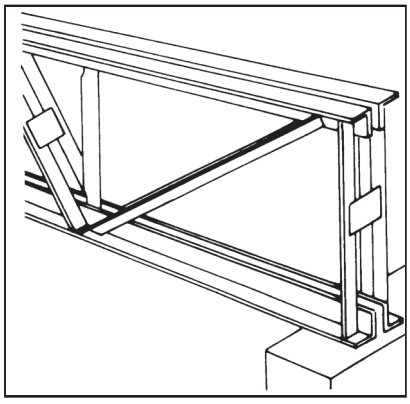
TOP CHORD EXTENSION
See Note (a)

(a) Extended top chords or full depth cantilever ends require the special attention of the specifying professional.
The magnitude and location of the design loads to be supported, the deflection requirements, and the proper bracing shall be clearly indicated on the structural drawings.

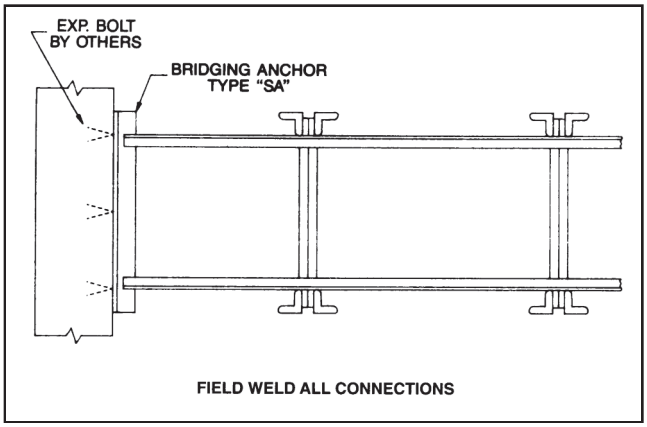
(b) See SJI Specification - Section 105 for Handling and Erection of LH and DLH joists.

(c) The Occupational Safety and Health Administration Standards (OSHA), Paragraph 1910.12 refers to Paragraph 1518.751 of "Construction Standards" which states:
"In steel framing, where bar joists are utilized, and columns are not framed in at least two directions with structural steel members, a bar joist shall be field-bolted at columns to provide lateral stability during construction."

NOTE: Configurations may vary from that shown.



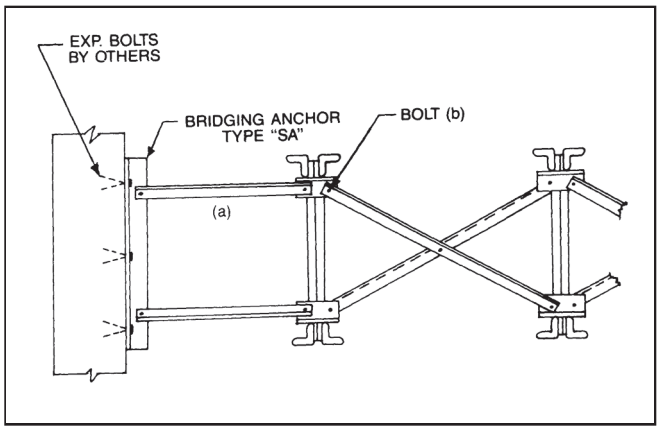
SQUARE END
See SJI Specification 104.5 (f).
Cross bridging required at end of bottom bearing joist.



HORIZONTAL BRIDGING

For the proper use of horizontal bridging refer to sections 104.5(a) and 105.

NOTE: Do not weld bridging to web members. Do not hang any mechanical, electrical, etc. from bridging.



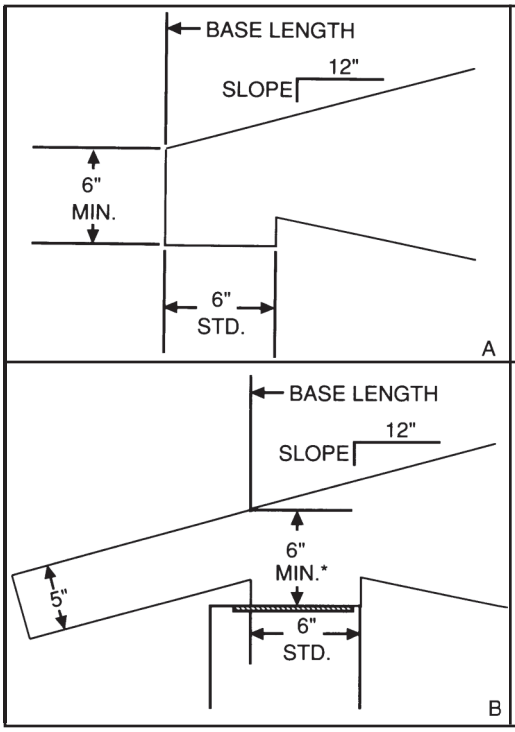
CROSS BRIDGING

(a) Horizontal Bridging units shall be used in the space adjacent to the wall to allow for proper deflection of the joist nearest the wall.

(b) For required bolt size refer to bridging table on page 136. NOTE: Clip configuration may vary from that shown.

LH & DLH SERIES OPEN WEB STEEL JOISTS SLOPED SEAT REQUIREMENTS

LOW END HIGH END



SLOPE RATE	HIGH END MINIMUM **SEAT DEPTH d
1/4:12	6 1/2"
3/8:12	6 1/2"
1/2:12	6 1/2"
1:12	6 1/2"
1 1/2:12	7"
2:12	7"
2 1/2:12	7 1/2"
3:12	7 1/2"
3 1/2:12	8"
4:12	8 1/2"
4 1/2:12	8 1/2"
5:12	9 1/2"
6:12 & OVER SEE BELOW	

* 7 1/2" at 18 and 19 chord section numbers. Consult Vulcraft for information when TCX's are present.
** Add 2 1/2" to seat depths at 18 and 19 chord section numbers.

NOTES:
(1) Depths shown are the minimums required for fabrication of sloped bearing seats.
(2) $d = 5/8 + 5 / \cos\theta + 6 \tan\theta$
(3) Clearance must be checked at outer edge of support as shown in detail B. Increase bearing depth as required to permit passage of 5" deep extension.
(4) If extension depth greater than 5" is required (see detail B and D) increase bearing depths accordingly.

HIGH STRENGTH

ECONOMICAL

DESIGN – Vulcraft LH & DLH Series long span steel joists are designed in accordance with the specifications of the Steel Joist Institute.

ACCESSORIES see page 45.

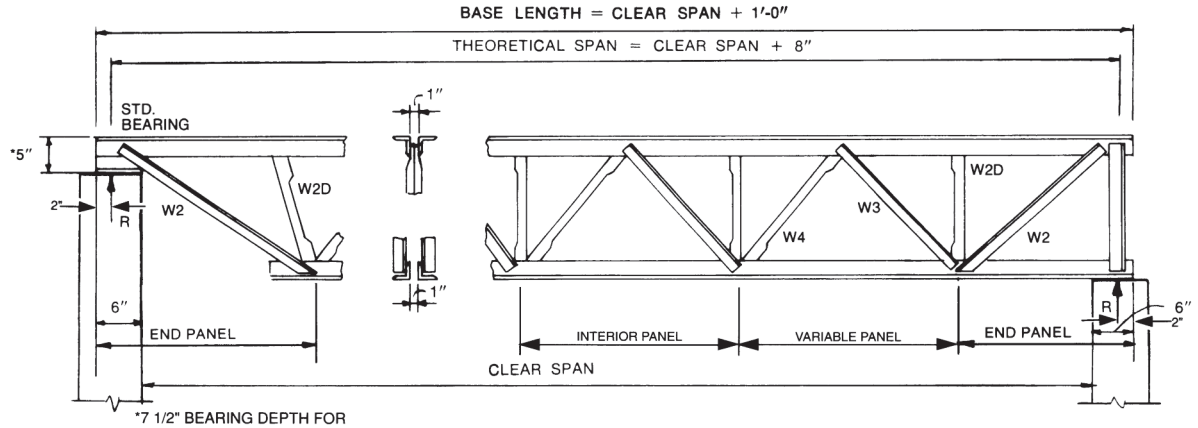
ROOF SPANS TO 144'-0

FLOOR SPANS TO 120'-0

PAINT – Vulcraft joists receive a shop-coat of rust inhibitive primer whose performance characteristics conform to those of the Steel Joist Institute specification 102.4.

SPECIFICATIONS see page 50.

LH & DLH SERIES DETAILS



MAXIMUM JOIST SPACING FOR DIAGONAL BRIDGING					
BRIDGING ANGLE SIZE-EQUAL LEG ANGLES					
JOIST DEPTH	1x7/64 (25mm x 3mm) r =.20"	1-1/4x7/64 (32mm x 3mm) r =.25"	1-1/2x7/64 (38mm x 3mm) r =.30"	1-3/4x7/64 (45mm x 3mm) r =.35"	2x1/8 (51mm x 3mm) r =.40"
32	6'-1"(1854mm)	7'-10"(2387mm)	9'-7"(2921mm)	11'-4"(3454mm)	13'-0"(3962mm)
36		7'-9"(2362mm)	9'-6"(2895 mm)	11'-3"(3429mm)	12'-11"(3973mm)
40		7'-7"(2311mm)	9'-5"(2870 mm)	11'-2"(3403mm)	12'-10"(3911mm)
44		7'-5"(2260mm)	9'-3"(2819 mm)	11'-0"(3352mm)	12'-9"(3886mm)
48		7'-3"(2209mm)	9'-2"(2794 mm)	10'-11"(3327mm)	12'-8"(3860mm)
52			9'-0"(2743 mm)	10'-9"(3276mm)	12'-7"(3835mm)
56			8'-10"(2692 mm)	10'-8"(3251mm)	12'-5"(3784mm)
60			8'-7"(2616 mm)	10'-6"(3200mm)	12'-4"(3759mm)
64			8'-5"(2565 mm)	10'-4"(3149mm)	12'-2"(3708mm)
68			8'-2"(2489 mm)	10'-2"(3098mm)	12'-0"(3657mm)
72			8'-0"(2438 mm)	10'-0"(3048mm)	11'-10"(3606mm)

LH & DLH TABLE MINIMUM BEARING LENGTHS			
Joist Type	On Masonry	On Concrete	On Steel
LH 02 thru 17 DLH 10 thru 19	6"	6"	4"
MINIMUM BEARING PLATE WIDTHS			
LH 02 thru LH 12 DLH 10 thru DLH 12	9"	9"	
LH 13 thru LH 17 DLH 13 thru DLH 19	12"	12"	

MAXIMUM JOIST SPACING FOR HORIZONTAL BRIDGING SPANS OVER 60' REQUIRE BOLTED DIAGONAL BRIDGING						
BRIDGING ANGLE SIZE-EQUAL LEG ANGLES						
SECTION NUMBER*	1x7/64 (25mm x 3mm) r = .20"	1-1/4x7/64 (32mm x 3mm) r = .25"	1-1/2x7/64 (38mm x 3mm) r = .30"	1-3/4x7/64 (45mm x 3mm) r = .35"	2x1/8 (51mm x 3mm) r = .40"	2-1/2x5/32 (64mm x 4mm) r = .50"
02, 03, 04	4'-7"(1397mm)	6'-3"(1905mm)	7'-6"(2286mm)	8'-9"(2667mm)	10'-0"(3048mm)	12'-4"(3759mm)
05 - 06	4'-1"(1245mm)	5'-9"(1753mm)	7'-6"(2286mm)	8'-9"(2667mm)	10'-0"(3048mm)	12'-4"(3759mm)
07 - 08	3'-9"(1143mm)	5'-1"(1549mm)	6'-8"(2032mm)	8'-6"(2590mm)	10'-0"(3048mm)	12'-4"(3759mm)
09 - 10		4'-6"(1372mm)	6'-0"(1829mm)	7'-8"(2337mm)	10'-0"(3048mm)	12'-4"(3759mm)
11 - 12		4'-1"(1245mm)	5'-5"(1651mm)	6'-10"(2083mm)	8'-11"(2718mm)	12'-4"(3759mm)
13 - 14		3'-9"(1143mm)	4'-11"(1499mm)	6'-3"(1905mm)	8'-2"(2489mm)	12'-4"(3759mm)
15 - 16			4'-3"(1295mm)	5'-5"(1651mm)	7'-1"(2159mm)	11'-0"(3353mm)
17			4'-0"(1219mm)	5'-1"(1549mm)	6'-8"(2032mm)	10'-5"(3175mm)

*REFER TO THE LAST DIGITS OF JOIST DESIGNATION CONNECTION TO JOIST MUST RESIST FORCES LISTED IN TABLE 104.5.1.

SECTION NUMBER*	MAX. SPACING OF LINES OF BRIDGING	HORIZONTAL BRACING FORCE**	
		lbs.	(N)
02, 03, 04	11'-0" (3352mm)	400	(1779)
05 - 06	12'-0" (3657mm)	500	(2224)
07 - 08	13'-0" (3962mm)	650	(2891)
09 - 10	14'-0" (4267mm)	800	(3558)
11 - 12	16'-0" (4876mm)	1000	(4448)
13 - 14	16'-0" (4876mm)	1200	(5337)
15 - 16	21'-0" (6400mm)	1600	(7117)
17	21'-0' (6400mm)	1800	(8006)
18 - 19	26'-0" (7924mm)	2000	(8896)

NUMBER OF LINES OF BRIDGING BASED ON CLEAR SPAN.
*LAST TWO DIGITS OF JOIST DESIGNATION.
**NOMINAL BRACING FORCE IS UNFACTORED.

MIN. A307 BOLT REQ'D FOR CONNECTION		
SERIES	SECTION NUMBER*	A307 BOLT DIAMETER
LH/DLH	2 - 12	3/8" (9mm)
LH/DLH	13 - 17	1/2" (12mm)
DLH	18 & 19	5/8" (15mm)

*LAST TWO DIGITS OF JOIST DESIGNATION.

NOTES:1. Special designed LH and DLH can be supplied in longer lengths. See SLH Series Page 73.

2. Additional bridging may be required when joists support standing seam roof decks. The specifying professional should require that the joist manufacturer check the system and provide bridging as required to adequately brace the joists against lateral movement. For bridging requirements due to uplift pressures refer to sect. 104.12.