SECTION 200. SCOPE

These specifications cover the design, manufacture and use of Super Longspan Steel Joists SLH Series.

SECTION 201. DEFINITION

The term "Super Longspan Steel Joists SLH Series" as used herein, refers to open web, load-carrying members utilizing hot-rolled steel. SLH series are suitable for the direct support of roof decks in buildings.

The design for SLH Series joist chord or web sections shall be based on a yield strength of at least 36,000 psi, but not greater than 50,000 psi. Steel used for SLH Series joist chord or web sections shall have a minimum yield strength determined in accordance with one of the procedures specified in Section 202.2, which is equal to the yield strength assumed in the design. SLH Series joists shall be designed in accordance with these specifications to support the loads given in the attached Standard Load Tables for SLH Series joists.

SECTION 202. MATERIALS

202.1 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, 45, and 50.
- High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 inches (102 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 102.2.

202.2 MECHANICAL PROPERTIES

The yield strength used as a basis for the design stresses prescribed in Section 203 shall be at least 36,000 psi, but shall not be greater than 50,000 psi. 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.

In the case of material, the mechanical properties of which conform to the requirements of one of the listed specifications, test specimens and procedure 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 procedure 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 for sheet and strip or (b) 18 percent in 8 inches 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, and A588/A588M whichever specification is applicable on the basis of design yield strength. The number of tests shall be as prescribed in ASTM A6 for plates, shapes, and bars; and ASTM A570/A570M, A606, AND A607 for the sheet and strip.

202.3 WELDING ELECTRODES

The following electrodes shall be used for arc welding:

(a) For connected members both having a specified minimum yield strength greater than 36,000 psi

AWS A5.1 or A5.5, E70XX
AWS A5.17, F7X, EXXX flux electrode combination
AWS A5.18. E70S-X or E70U-1
AWS A5.20, E70T-X

(b) For connected members both having a specified minimum yield strength of 36,000 psi or one having a specified minimum yield strength of 36,000 psi and the other having a specified minimum yield strength greater than 36,000 psi

AWS A5.1, E60XX
AWS A5.17, F6X-EXXX flux electrode combination
AWS A5.20, E6O0T-X
or any of those listed in Section 202.3 (a)

Other welding methods, providing equivalent strength as demonstrated by tests, may be used.

202.4 PAINT

The Standard shop paint is a **primer coat** 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. 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 one of the above listed specifications.

SECTION 203. DESIGN AND MANUFACTURE

203.1 METHOD

Joists shall be designed in accordance with these specifications as simply supported uniformly loaded trusses supporting a 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 American Institute of Steel Construction Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, latest adoption, where the material used consists of plates, shapes or bars.

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.

203.2 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) $\Omega_t = 1.67$ (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) (203.2-1)

Allowable Stress = $0.6F_y$ (ASD) (203.2-2)

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

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

$$F_{cr} = Q\left[0.658^{\left(\frac{QF_y}{F_e}\right)}\right]F_y \qquad (203.2\text{-}3)$$

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

$$F_{cr} = 0.877F_e \qquad (203.2\text{-}4)$$

Where, F_e = elastic buckling stress determined in accordance with Equation 203.2-5.

$$F_e = \frac{\pi^2 E}{\left(K\ell/r\right)^2} \qquad (203.2\text{-}5)$$

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

Design Stress = $0.9F_{cr}$ (LRFD) (203.2-6)

Allowable Stress = $0.6F_{cr}$ (ASD) (203.2-7)

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) $\Omega_6 = 1.67$ (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) (203.2-8)

Allowable Stress = $0.6F_y$ (ASD) (203.2-9)

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) (203.2-10)

Allowable Stress = $0.95F_y$ (ASD) (203.2-11)

For bearing plates:

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

Design Stress = $1.35F_y$ (LRFD) (203.2-12)

Allowable Stress = $0.9F_y$ (ASD) (203.2-13)

(d) Weld Strength:

Shear at throat of fillet welds:

Nominal Shear Stress = $F_{nw} = 0.6F_{exx}$ (203.2-14)

LRFD: $\phi_w = 0.75$

Design Shear Strength =

$\phi R_n = \phi_w F_{nw} A = 0.45F_{exx} A$ (203.2-15)

ASD: $\Omega_w = 2.0$

Allowable Shear Strength =

$R_n/\Omega_w = F_{nw}A/\Omega_w = 0.3F_{exx} A$ (203.2-16)

A = effective throat area

Made with E70 series electrodes or F7XX-EXXX flux-electrode combinations. . . . . $F_{exx} = 70$ ksi (483 MPa)

Made with E60 series electrodes or F6XX-EXXX flux-electrode combinations. . . . . $F_{exx} = 60$ ksi (414 MPa)

Tension or compression on groove or butt welds shall be the same as those specified for the connected material.

203.3 MAXIMUM SLENDERNESS RATIOS

The slenderness ratios, $1.0\,\ell/r$ and $1.0\,\ell_s/r$ of members as a whole or any component part shall not exceed the values given in Table 203.3-1, Parts A.

The effective slenderness ratio, $K\ell/r$*, to be used in calculating the nominal stresses F_{cr} and F'_e, is the largest value as determined from Table 203.3-1, Parts B and C.

In compression members when fillers or ties are used, they shall be spaced so that the ℓ_s/r_z ratio of each component does not exceed the governing ℓ/r ratio of the member as a whole.

The terms used in Table 203.3-1 are defined as follows:

ℓ = Length center-to-center of panel points, except $\ell = 36$ in. (914 mm) for calculating ℓ/r_y of top chord member.

ℓ_s = maximum length center-to-center between panel point and filler (tie), or between adjacent fillers (ties).

r_x = member radius of gyration in the plane of the joist.

r_y = member radius of gyration out of the plane of the joist.

r_z = least radius of gyration of a member component.

* See P.N. Chod and T. V. Galambos, Compression Chords Without Fillers in Longspan Steel Joists, Research Report No. 36, June 1975 Structural Division, Civil Engineering Department, Washington University, St. Louis, MO.

TABLE 203.3-1
MAXIMUM AND EFFECTIVE SLENDERNESS RATIOS

I TOP CHORD INTERIOR PANEL

A. The slenderness ratios, 1.0 ℓ/r and 1.0 ℓ_s/r, of members as a whole or any component part shall not exceed 90.

B. *The effective slenderness ratio to determine* "F_{cr}"				
1. With fillers or ties	0.75 ℓ/r_x	1.0 ℓ/r_y		1.0 ℓ_s/r_z
2. Without fillers or ties			0.75 ℓ/r_z	
3. Single component members	0.75 ℓ/r_x	1.0 ℓ/r_y		
C. *The effective slenderness ratio to determine* "F'_e"				
1. With fillers or ties	0.75 ℓ/r_x			
2. Without fillers or ties	0.75 ℓ/r_x			
3. Single component members	0.75 ℓ/r_x			

II TOP CHORD END PANEL

A. The slenderness ratios, 1.0 ℓ/r and 1.0 ℓ_s/r, of members as a whole or any component part shall not exceed 120.

B. *The effective slenderness ratio to determine* "F_{cr}"				
1. With fillers or ties	1.0 ℓ/r_x	1.0 ℓ/r_y		1.0 ℓ_s/r_z
2. Without fillers or ties			1.0 ℓ/r_z	
3. Single component members	1.0 ℓ/r_x	1.0 ℓ/r_y		
C. The effective slenderness ratio to determine "F'_e"				
1. With fillers or ties	1.0 ℓ/r_x			
2. Without fillers or ties	1.0 ℓ/r_x			
3. Single component members	1.0 ℓ/r_x			

III TENSION MEMBERS - CHORDS AND WEBS

A. The slenderness ratios, 1.0 ℓ/r and 1.0 ℓ_s/r, of members as a whole or any component part shall not exceed 240.

IV COMPRESSION WEB MEMBERS

A. The slenderness ratios, 1.0 ℓ/r and 1.0 ℓ_s/r, of members as a whole or any component part shall not exceed 200.

B. *The effective slenderness ratio to determine* "F_{cr}"				
1. With fillers or ties	0.75 ℓ/r_x	1.0 ℓ/r_y		1.0 ℓ_s/r_z
2. Without fillers or ties			1.0 ℓ/r_z	
3. Single component members	0.75 ℓ/r_x*	1.0 ℓ/r_y		

* 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.

203.4 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 $\ell/170$ where ℓ is the spacing in inches (millimeters) between lines of bridging as specified in Section 204.5(d)

The top chord shall be considered as stayed laterally by the floor slab or roof deck provided the requirements of Section 204.9(e) of this specification are met.

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:

$$f_{au} + f_{bu} \le 0.9F_y \qquad (203.4\text{-}1)$$

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

$$\frac{f_{au}}{\phi_c F_{cr}} + \frac{8}{9}\left[\frac{C_m f_{bu}}{\left[1-\left(\dfrac{f_{au}}{\phi_c F'_e}\right)\right]Q\phi_b F_y}\right] \le 1.0 \qquad (203.4\text{-}2)$$

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

$$\left(\frac{f_{au}}{2\phi_c F_{cr}}\right) + \left[\frac{C_m f_{bu}}{\left[1-\left(\dfrac{f_{au}}{\phi_c F'_e}\right)\right]Q\phi_b F_y}\right] \le 1.0 \qquad (203.4\text{-}3)$$

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 203.2(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)

$$F'_e = \frac{\pi^2 E}{\left(K\ell/r_x\right)^2}, \text{ ksi (MPa)}$$

Where ℓ is the panel length,in inches (millimeters), as defined in Section 203.2(b) and r_x is the radius of gyration about the axis of bending.

Q = Form factor defined in Section 203.2(b)

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

For ASD:

at the panel point:

$$f_a + f_b \le 0.6F_y \qquad (203.4\text{-}4)$$

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

$$\frac{f_a}{F_a} + \frac{8}{9}\left[\frac{C_m f_b}{\left[1-\left(\dfrac{1.67 f_a}{F'_e}\right)\right]QF_b}\right] \le 1.0 \qquad (203.4\text{-}5)$$

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

$$\left(\frac{f_a}{2F_a}\right) + \left[\frac{C_m f_b}{\left[1-\left(\dfrac{1.67 f_a}{F'_e}\right)\right]QF_b}\right] \le 1.0 \qquad (203.4\text{-}6)$$

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 203.2(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.

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 1½ percent of the top chord axial force.

(c) Depth

Joists can have either a top chord pitch of 1/4 inch per foot or parallel chords. The depth, for the purpose of design, in all cases shall be the depth at mid-span. Parallel chord joists must be installed with a minimum slope of 1/4 inch per foot.

(d) Eccentricity

Members connected at a joint shall have their center of gravity lines meet at a point, if practical. Eccentricity on either side of the neutral axis of chord members may be neglected when it does not exceed the distance between the neutral axis and the back of the chord. Otherwise, provision shall be made for the stresses due to eccentricity. Ends of joists shall be proportioned to resist bending produced by eccentricity at the support.

(e) Extended Ends

Extended top chords or full depth cantilever ends require the special attention of the specifying engineer or architect.

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.

203.5 CONNECTIONS

(a) Methods

Joint connections and splices shall be made by attaching the members to one another by arc or resistance welding or other approved method.

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 layers of weld metal and between weld metal 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 for welds oriented parallel to the principal stress.
   - (f) The sum of surface (piping) porosity diameters shall not exceed 1/16 inch in any 1 inch 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.

3) Weld inspection by Outside Agencies (See Section 204.14 of these specifications).

   The agency shall arrange for visual inspection to determine that welds meet the acceptance standards of Section 203.5 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

Joint connections shall develop the maximum force due to any of the design loads, but not less than 50 percent of the allowable strength of the member in tension or compression, whichever force is the controlling factor in the selection of the member.

(c) Shop Splices

Shop splices may occur at any point in chord or web members. Splices shall be designed for the member force, but not less than 50 percent of the allowable member strength. Members containing a butt weld splice shall develop an ultimatetensile force of at least 57,000 psi 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 splice.

(d) Field Splices

Field splices shall be bolted connections designed by the manufacturer. Splices shall be designed for the member shear and moment forces, but not less than 50 percent of the member strength.

(e) Bridging Clips

Where double angles, separated by a nominal gap, are used as chord members, the two angles must be tied together with a filler or tie at all bridging clip locations. These fillers and their connections must be capable of developing the bridging forces indicated by Section 204.6 (d).

203.6 CAMBER

Joists shall have approximate cambers in accordance with the following:

TABLE 203.6.1

Top Chord Length	Double Pitch Joists*	Parallel Chord Joists
111'-0"	3 1/4"	5 1/4"
120'-0"	3 1/2"	6"
130'-0"	3 7/8"	7"
140'-0"	4 1/8"	8"
150'-0"	4 3/8"	8 3/4"
160'-0"	4 3/4"	9 1/2"
180'-0"	5 1/4"	10 1/2"
200'-0"	5 7/8"	11 3/4"
220'-0"	6 1/2"	13"
240'-0"	7"	14"

* Pitched 1 1/4 in 12" or greater

203.7 SHOP PAINTING

Joists and accessories shall receive one shop coat of protective paint as specified in Section 202.4.

203.8 VERIFICATION OF DESIGN

Design data on SLH series joists will be supplied to the specifying engineer upon request.

SECTION 204. APPLICATION

204.1 USAGE

These specifications shall apply to any type of structure where roof decks are to be supported directly by steel joists installed as herein specified. Where joists are used other than on simple spans under uniformly distributed loading, as prescribed in Section 203.1, they shall be investigated and modified if necessary to limit the unit stresses to those listed in Section 203.2.

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.

204.2 SPAN

The clear span of joists shall not exceed 24 times their nominal depth.

204.3 DEPTH

The nominal depth of pitched chord joists shall be the depth at mid-span. The standard pitch of the top chord shall be 1/4 inch per foot.

204.4 PITCH

The standard configuration for SLH Series Joists is a double pitched top chord with a pitch of 1/4 inch per foot. The double pitched design was selected for economy and positive roof drainage.

204.5 END SUPPORTS

(a) Masonry and Concrete

SLH 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 and lateral forces shall be taken by the specifying engineer or architect in the design of the steel bearing plate and the masonry or concrete. The ends of SLH Series Joists shall extend over the masonry or concrete support not less than the distance shown in Table 204.5.1. The plate shall be located not more than 1/2 inch from the face of the wall and shall be not less than 9 inches wide perpendicular to the length of the joist. It is to be designed by the specifying engineer or architect in compliance with the allowable unit stresses in Section A5.1 (Allowable Stress Design) of the AISC Specifications, of latest adoption. The steel bearing plate shall be furnished by other than the joist manufacturer.

(b) Steel

Due consideration of the end reactions and all other vertical and lateral forces shall be taken by the specifying engineer or architect in the design of the steel support. The end of SLH Series Joists shall extend over the steel support a distance not less than that shown in Table 204.5.1.

TABLE 204.5.1

Joist Section Number	Minimum Bearing Length*
SLH 15-18	4"
SLH 19-25	6"

*Excluding extension

204.6 BRIDGING

(a) Horizontal
Horizontal bridging lines shall consist of two continuous horizontal steel members, one attached to the top chord and the other attached to the bottom chord. The *l*/r ratio of the bridging member shall not exceed 300, where *l* is the distance in inches between attachments and r is the least radius of gyration of the bridging member.

(b) Diagonal
Diagonal bridging lines shall consist of cross-bracing with *l*/r ratio of not more than 200, where *l* is the distance in inches 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 between connections at the point of intersection of the bracing members and the connections to the chords of the joists.

(c) Bridging Lines
Bolted diagonal bridging shall be used except when the joist spacing is less than .66 x joist depth, then bolted horizontal bridging shall be used in addition to diagonal bridging.

(d) Spacing
The maximum spacing of lines of bridging shall not exceed the values in Table 204.6.1. Bridging shall be installed near a bottom chord panel point or an extra web member shall be furnished to brace the bottom chord for the vertical component of the bridging force equal to the horizontal bracing force. See Section 204.13 for bridging required for uplift forces.

TABLE 204.6.1

Joist-Section Number*	Max. Spac. Of Lines Of Bridging	Horizontal Bracing Force**
15 to 17	21'-0"	2,700 lbs
18	21'-0"	3,400 lbs
19	26'-0"	3,400 lbs
20	26'-0"	3,700 lbs
21	30'-0"	4,200 lbs
22	30'-0"	5,000 lbs
23	30'-0"	5,500 lbs
24	30'-0"	6,300 lbs
25	30'-0"	7,100 lbs

The number of lines of bridging is based on the joists clear span dimensions.

* Last two digits of designation shown in load table.

** Each connection to the chord shall resist one-half of this force.

(e) Connections
Connections to the chords of the steel joists and bridging anchors shall be made by positive mechanical means and capable of resisting a horizontal force not less than that specified in Table 204.6.1.

(f) Bottom Chord Bearing Joists
It is not recommended that SLH-Series joists be used in bottom chord bearing configuration.

204.7 INSTALLATION OF BRIDGING

All bridging and bridging anchors shall be completely installed before construction loads are placed on the joists. 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 plans.

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

204.8 END ANCHORAGE

(a) Masonry and Concrete
Ends of SLH Series Joists resting on steel bearing plates on masonry or structural concrete shall be attached thereto as shown Table 204.8.1.

(b) Steel
Ends of SLH Series Joists resting on steel supports shall be attached thereto as shown in Table 204.8.1. In steel frames, where columns are not framed in at least two directions with structural steel members, joists at column lines shall be field bolted at the columns to provide lateral stability during construction.

TABLE 204.8.1 END ANCHORAGE

Joist Section No.*	Fillet Weld	Bearing Seat Bolts For Erection
SLH 15-18	2 - 1/4" x 2"	2 - 3/4" A325
SLH 19-25	2 - 1/4" x 4"	2 - 3/4" A325

*Last two digits of designation shown in load table.

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

204.9 JOIST SPACING

Joists shall be spaced so that the loading on each joist does not exceed the allowable load given for the particular designation and span in the Load Table.

204.10 ROOF DECKS

(a) Material
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 not be less than 2 inches thick.

(c) Bearing
Slabs or decks shall bear uniformly along the top chords of the joist.

(d) Attachments

The spacing of attachments along the top chord shall not exceed 36 inches. Such attachments of the slab or deck to the top chords of joists shall be capable of resisting the following forces:

TABLE 204.10.1

Joist Section Number*	Equivalent Force Required
15 - 16 incl.	300 lbs./ft.
17 - 19 incl.	300 lbs./ft.
20 - 21 incl.	300 lbs./ft.
22 - 24 incl	420 lbs./ft.
25	520 lbs./ft.

*Last two digits of designation shown in load table.

(e) Wood Nailers

It is not recommended that SLH-Series joists be used in conjunction with wood nailers.

(f) 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. The maximum bridging spacing may not exceed that specified in Section 204.6d.

204.11 DEFLECTION

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

Roofs

l/360 of span where plaster ceiling is attached or suspended.

l/240 of span for all other cases.

The specifying engineer or architect shall give due consideration to the effects of deflection in selection of joists.

204.12 PONDING

Unless a roof surface is provided with sufficient slope toward points of free drainage or adequate individual drains to prevent the accumulation of rain water, the roof system shall be investigated to assure stability under ponding conditions in accordance with Section K2 (Allowable Stress Design) of the AISC Specifications.*

A top chord pitch of 1/4" or more per foot is recommended to minimize ponding.

The ponding investigation shall be performed by the specifying engineer or architect.

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

204.13 UPLIFT

Where uplift forces due to wind are a design requirement, these forces must be indicated on the structural drawings in terms of net uplift in pounds per square foot. When these forces are specified, they must be considered in the design of joists and bridging. A single line of bottom chord bridging must be provided near the first <u>bottom chord</u> panel points, whenever uplift due to wind forces is a design consideration.**

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

204.14 INSPECTION

Joists shall be inspected by the manufacturer before shipment to insure 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, he may reserve the right to do so in the "Invitation to Bid" or the accompanying "Job Specifications". Arrangements shall be made with the manufacturer for such inspection of the joists at the manufacturing facility by the purchaser's inspectors at purchaser's expense.

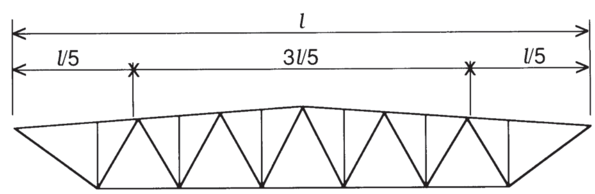
SECTION 205. HANDLING AND ERECTION*

Particular attention should be paid to the erection of Super Longspan Steel Joists.

Care shall be exercised at all times to avoid damage through careless handling during unloading, storing, and erecting. Dropping of joists shall not be permitted.

Each joist shall be adequately braced laterally before any loads are applied. If lateral support is provided by bridging, the bridging lines must be anchored to prevent lateral movement.

Hoisting cables attached at a panel point approximately 1/5 of the span from each end will minimize erection stresses in the steel joist. **The angle of the hoisting cables from the vertical shall not exceed 30 degrees.** Two cranes are recommended for spans greater than 150 feet.



<u>Hoisting cables shall not be released until all bridging lines are installed.</u> For ease of alignment, anchorage of joist ends in accordance with Section 204.8 should follow the installation of bridging. During the construction period, the contractor shall provide means for the adequate distribution of concentrated loads so the carrying capacity of any joist is not exceeded.

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