



A Professional Corporation

Technical Bulletin

FROM SPEIGHT, MARSHALL & FRANCIS, P.C.

Structural Engineering - Special Inspections

December 2006

Bulletin No. XXVII

Joist Seat Depths

Introduction:

Steel joists are typically sloped to create pitched roofs. To accommodate this type of design, K-series, LH-series and DLH-series steel joists may be required to have sloped bearing seats. A joist seat is considered to be sloped when the top chord is angled from (not parallel to) the bearing seat. As this angle increases, joist seats may be required to increase in depth.

Joist Seats for Nominally Flat Roofs:

For a nominally flat roof (roof with a pitch less than or equal to $\frac{1}{4}$ " per foot), the minimum seat depth required by the Steel Joist Institute (SJI), is $2\frac{1}{2}$ " for K-series joists and 5" for LH-series joists. Although the slope on nominally flat roofs can vary between zero and $\frac{1}{4}$ " per foot, sloped joist seats are not required.

Joist Seats for Roofs Exceeding the Nominally Flat Range:

When the slope exceeds $\frac{1}{4}$ " per foot, joist seats must increase in depth. Figures 1 and 2 were taken from pages 10 and 11 of the 2005 edition of the SJI manual. They summarize the minimum seat depth requirements for sloped joists. The depths shown are minimums required for fabrication of the seat, but, as noted in the tables, they should be increased as required to allow the passage of top chord extensions (as shown in Figure 1, Detail B), which are often used to create eaves at the perimeter of a building.

SLOPED SEAT REQUIREMENTS FOR SLOPES 3/8: 12 AND GREATER

K-SERIES OPEN WEB STEEL JOISTS

LOW END		HIGH END		SLOPE RATE	HIGH END SEAT DEPTH d (MIN.)
NO TCX	END OF SEAT 12" SLOPE	NO TCX	END OF SEAT 12" SLOPE		
2 1/2" MIN.	4" STD.	SEE CHART d	4" STD.	3/8: 12	3"
	A		C	1/2: 12	3"
				1: 12	3 1/2"
				1 1/2: 12	3 1/2"
				2: 12	4"
WITH TCX	END OF SEAT 12" SLOPE	WITH TCX	END OF SEAT 12" SLOPE	2 1/2: 12	4"
E.O.B.	2 1/2" 3" 4" STD.	SEE CHART d	2 1/2" 4" STD.	3: 12	4"
	B		D	3 1/2: 12	4 1/2"
				4: 12	4 1/2"
				4 1/2: 12	4 1/2"
				5: 12	5"
				6: 12 & OVER	SEE BELOW

NOTES:

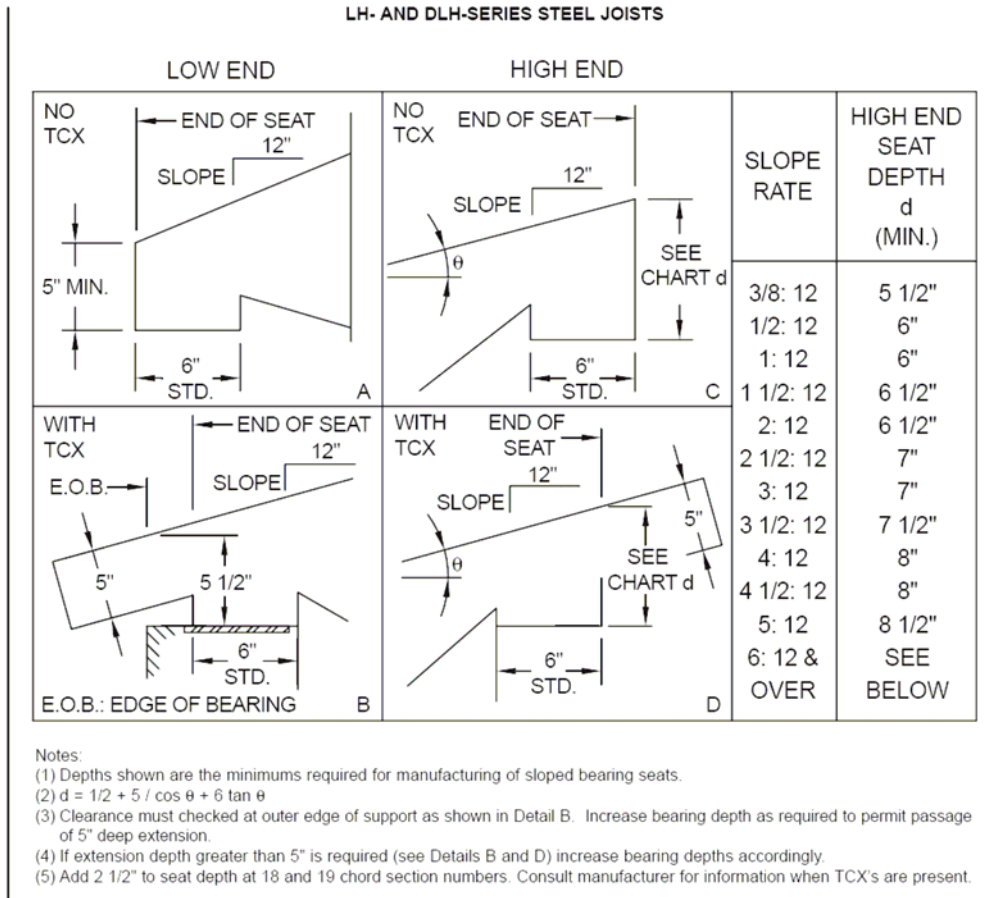
- (1) Depths shown are the minimums required for manufacturing of sloped bearing seats. Depths may vary depending on actual bearing conditions.
- (2) $d = 1/2 + 2.5 / \cos \theta + 4 \tan \theta$
- (3) Clearance must be checked at outer edge of support as shown in Detail B. Increase bearing depth as required to permit passage of $2\frac{1}{2}$ " deep extension.
- (4) If extension depth greater than $2\frac{1}{2}$ " is required (see Details B and D) increase bearing depths accordingly.
- (5) If slope is $1/4: 12$ or less, sloped seats are not required.

Figure 1

Although the increase in seat depth is required primarily for clearance and geometric purposes, it is required to center the reaction point of a joist over its bearing. At a flange of a support, seat depths are more a function of the reaction location than clearance. The seat depth is increased to eliminate eccentric bearing conditions. The joist seat depths shown in Figures 1 and 2 were derived from an equation that takes into account the location of a joist reaction point and the angle at which a joist slopes.

Figure 2

SLOPED SEAT REQUIREMENTS FOR SLOPES 3/8: 12 AND GREATER
LH- AND DLH-SERIES STEEL JOISTS



Conclusion:

Depending on the slope rate of a joist, joist seat depths may need to be increased. These joist seat dimensions should be utilized by the Architect to determine joist bearing elevations that create the desired roof slope and configuration.

Happy Holidays!



SPEIGHT, MARSHALL & FRANCIS, P.C.

2125 McComas Way, Suite 103
Virginia Beach, Virginia 23456



a-team@smandf.com



(757) 427-1020



(757) 427-5919