Nothing Flat About Steel Joists and Steel Deck On a Pitched Roof

MAY 15, 2019

Presented by:

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Polling Question

- New requirement to earn PDH credits
- Two questions will be asked during the duration of today's presentation
- The question will appear within the polling section of your GoToWebinar Control Panel to respond

Disclaimer

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Learning Objectives

- Describe the factors which impact sloped seats on steel joists.
- Identify the unique considerations for designing and specifying special profile steel joists.
- Summarize the general concerns with steel deck on sloping roofs, and how to properly specify its support.
- Explain the interaction of uplift and shear in steel roof deck diaphragms, and how diaphragms are affected by hip roofs.

Course Description

- Steel joists and steel deck are used to construct economical pitched roofs. This session will provide designers with details and design guidance to help with this situation.
- Included will be guidance on designing and detailing pitched diaphragms, and economical hip roof framing details.

Nothing Flat About Steel Joists and Steel Deck On a Pitched Roof

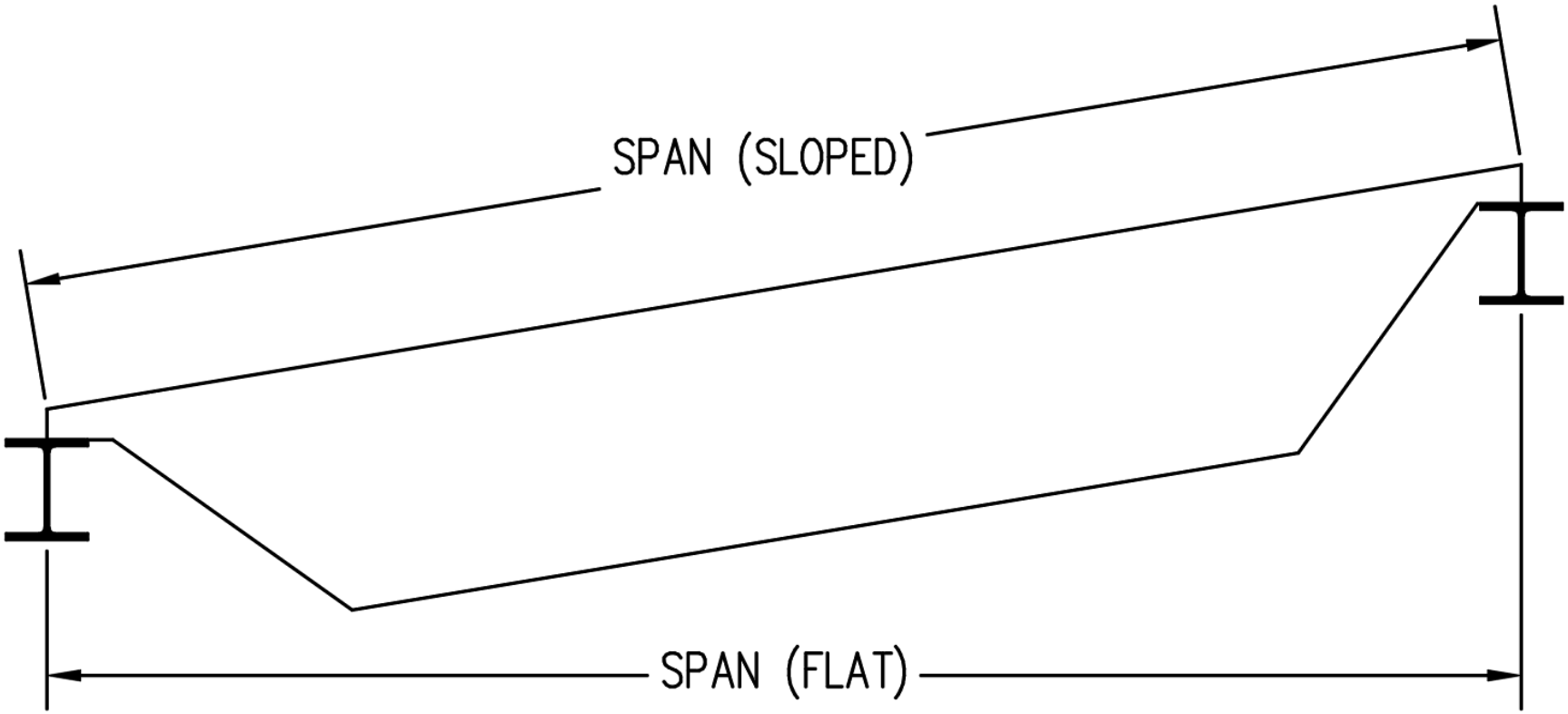
- Parallel Chord Joists
- Sloped Seats
- Pitched Top Chords
- Special Profile Joists
- Joists in a Hip Roof
- Curved Steel Deck
- Sloped Roof Planes
- Attaching Deck on Sloped Surfaces
- Uplift and Diaphragm Shear

Parallel Chord Joists

SJI first added the Definition for Sloped Joist in 2002

The **span** of a sloped *parallel chord* joist or Joist Girder shall be defined by the **length along the slope**

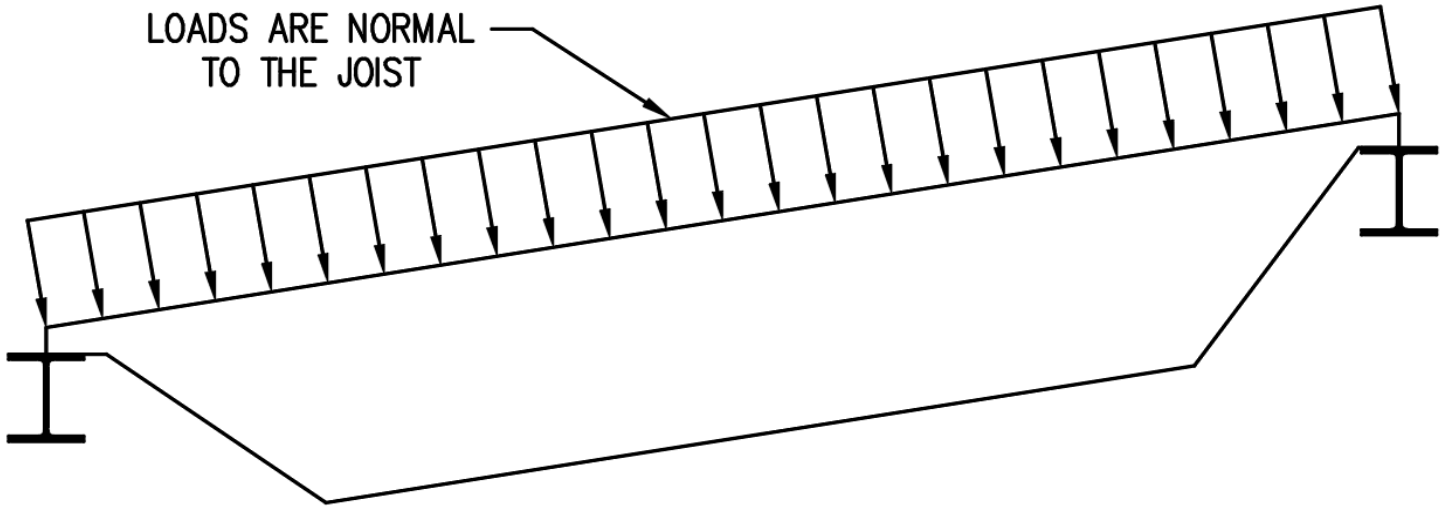
Parallel Chord Joists



SPAN OF SLOPED
PARALLEL CHORD JOISTS

Parallel Chord Joists

The SJI Load Table capacity shall be the component normal to the joist



SJI LOAD TABLE CAPACITY

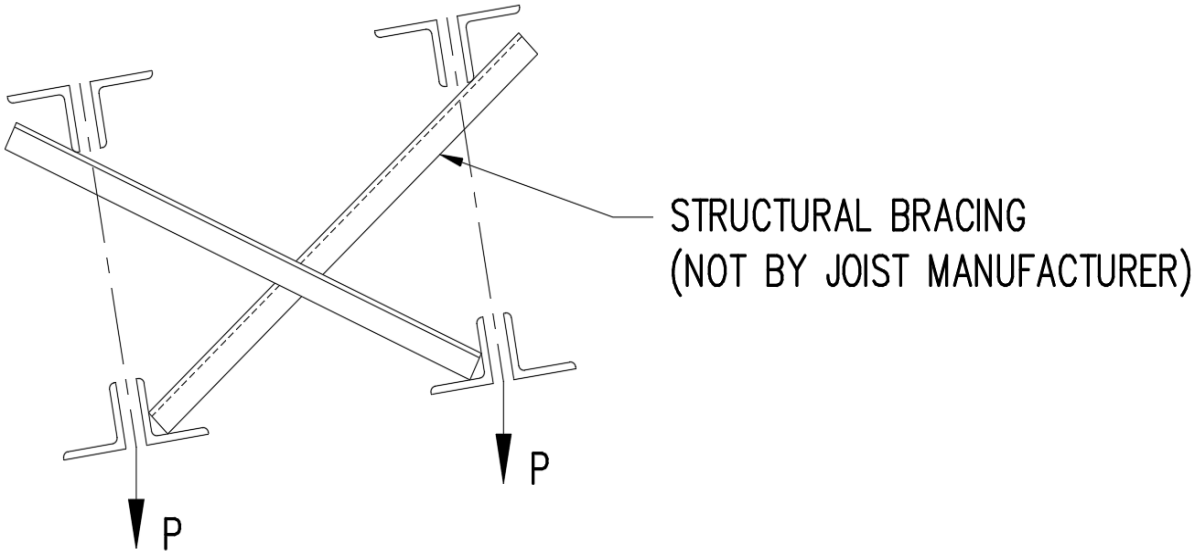
Parallel Chord Joists

A K-Series Constant Shear (**KCS**) Joist shall be **parallel chord only**

Sloped KCS Joists shall use the appropriate moment and shear capacity for the span as defined by the **length along the slope**

Parallel Chord Joists

Joist chords shall not carry out-of-plane or torsional loads, such as concentrated loads applied to laterally sloped joists



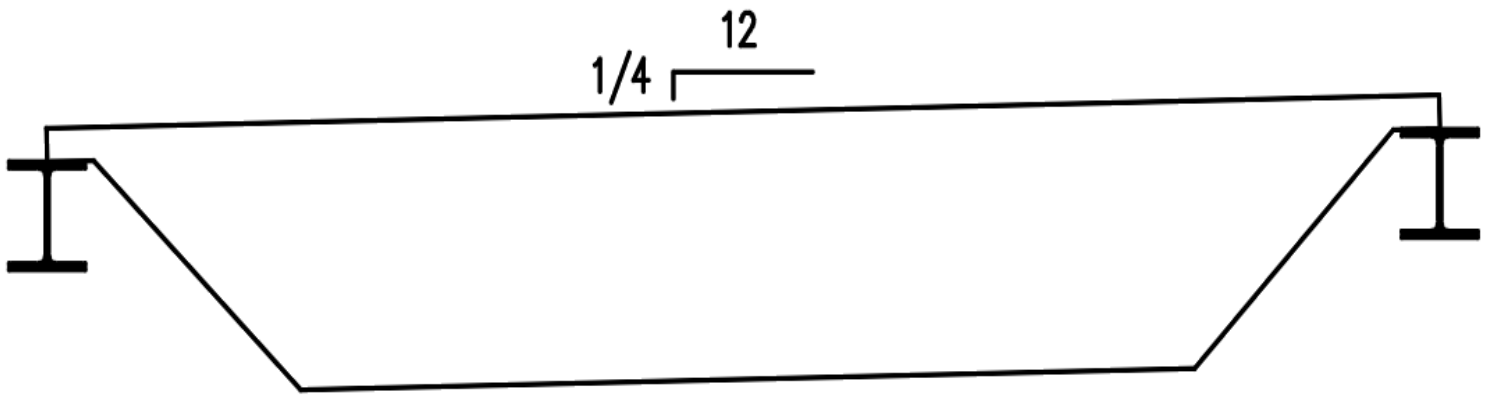
LATERALLY SLOPED JOISTS

Sloped Seats

Where steel joists or Joist Girders are sloped, the end bearing, or seats, may also be sloped

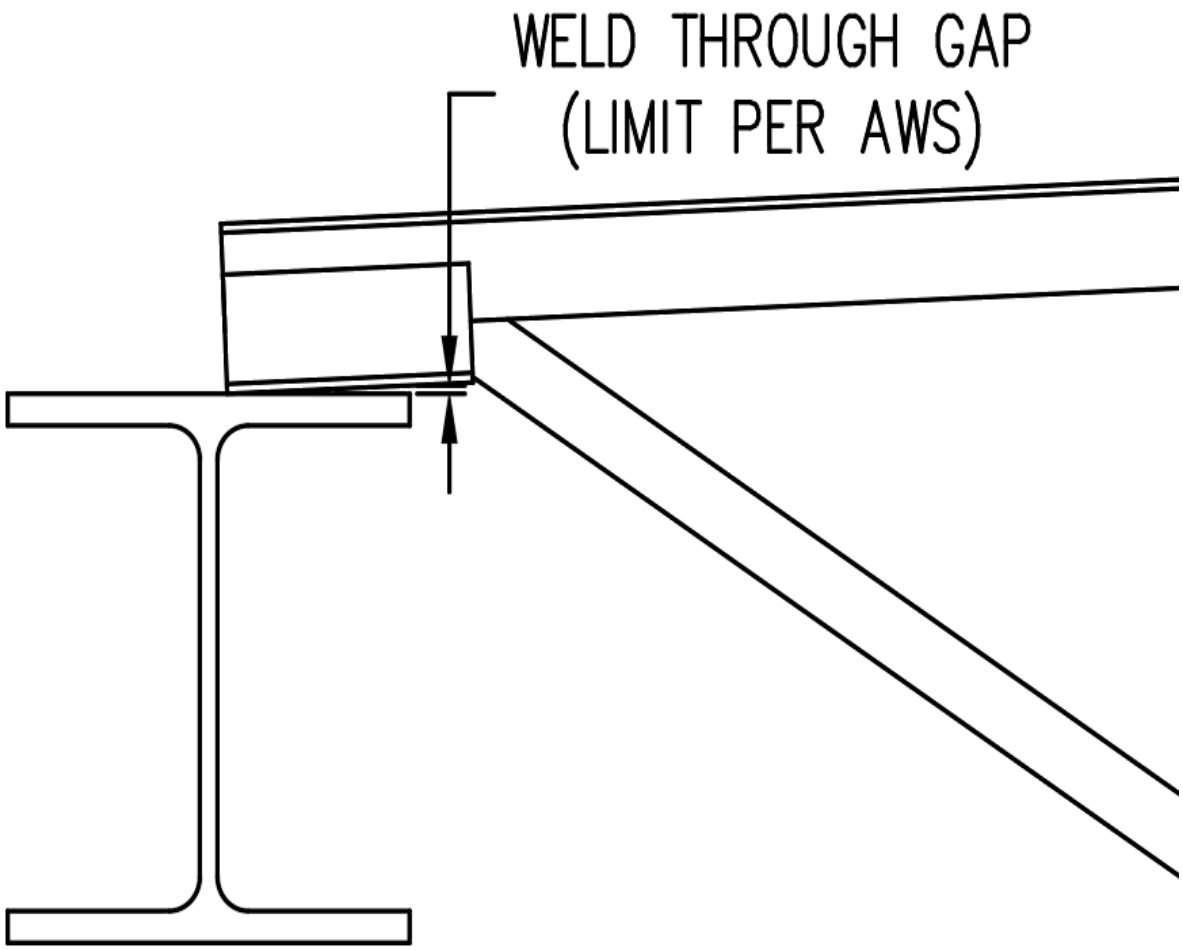
For K-Series Joists, seats are permitted to **not** be beveled for slopes of 1/4 inch or less per foot

Sloped Seats



JOIST SEATS NOT SLOPED

Sloped Seats



Sloped Seats

Sloped Seats

When sloped seats are required, the seat depths shall be adjusted to maintain standard height at the shallow end of the sloped seat

SJI publishes these requirements in:

Table 2.2-2 and 2.2-3

Sloped Seats

TABLE 2.2-2

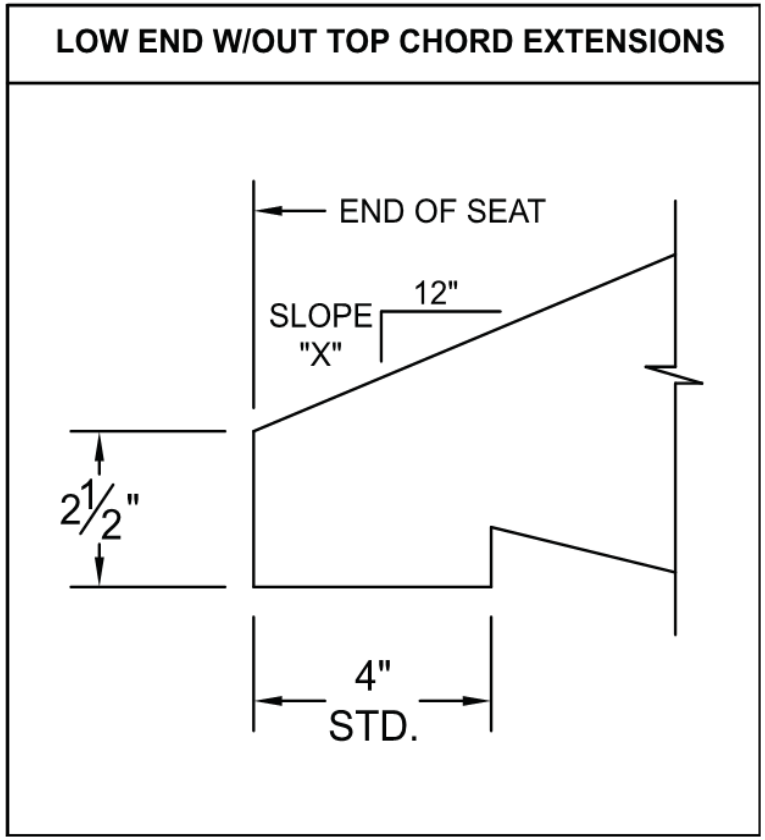
SLOPED SEAT REQUIRMENTS FOR SLOPES 3/8":12 AND GREATER
K-SERIES OPEN WEB STEEL JOISTS

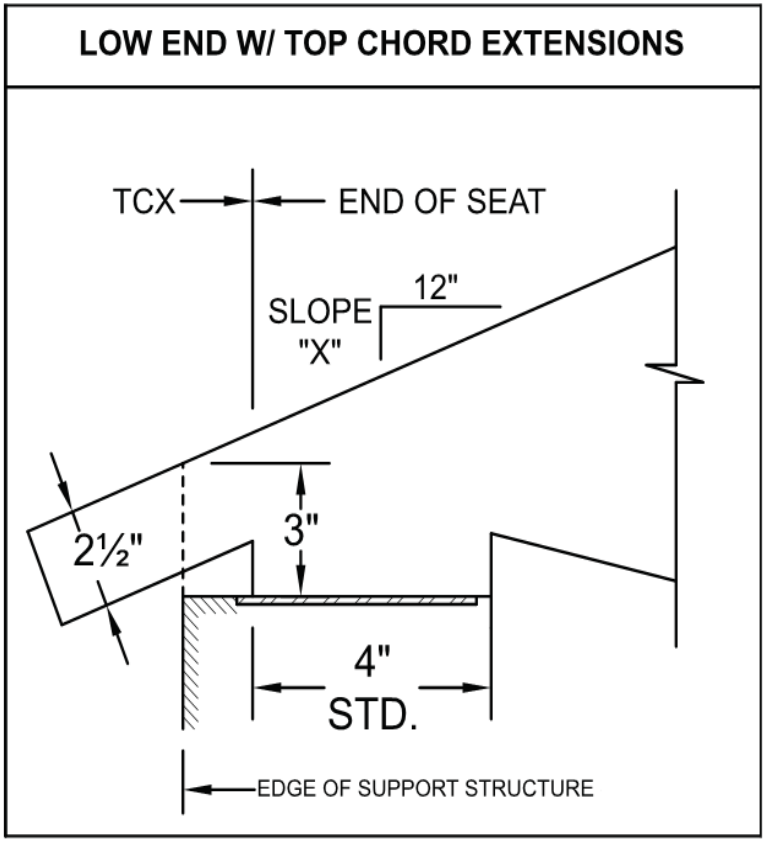
TABLE 2.2-3

SLOPED SEAT REQUIRMENTS FOR SLOPES 3/8":12 AND GREATER
LH- AND DLH-SERIES OPEN WEB STEEL JOISTS

Sloped Seats

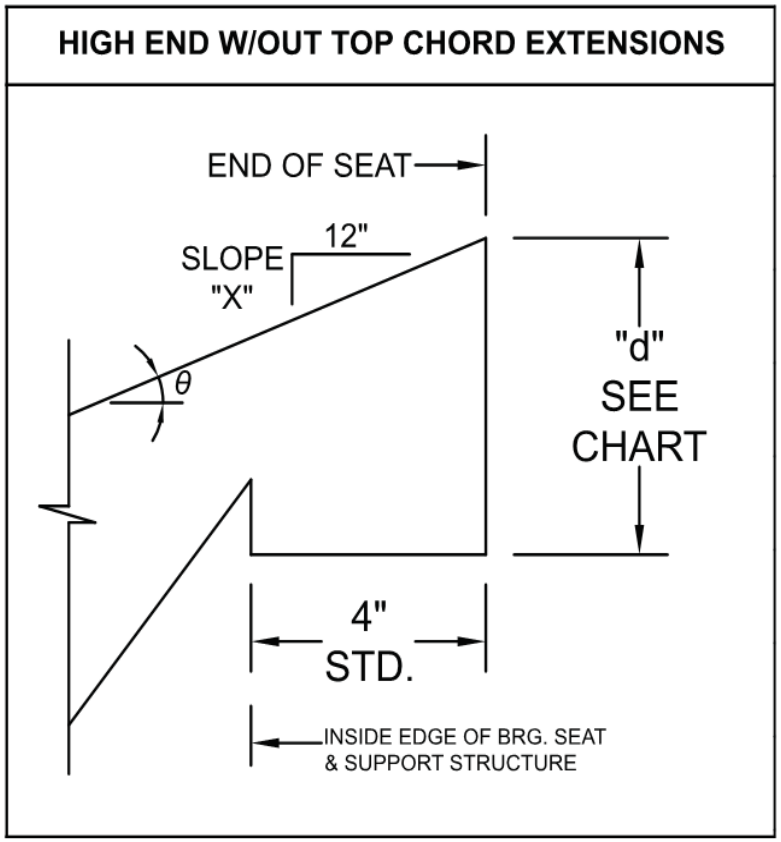
Closer look at Table 2.2-2 for **K-Series** Joists (**LOW END**)

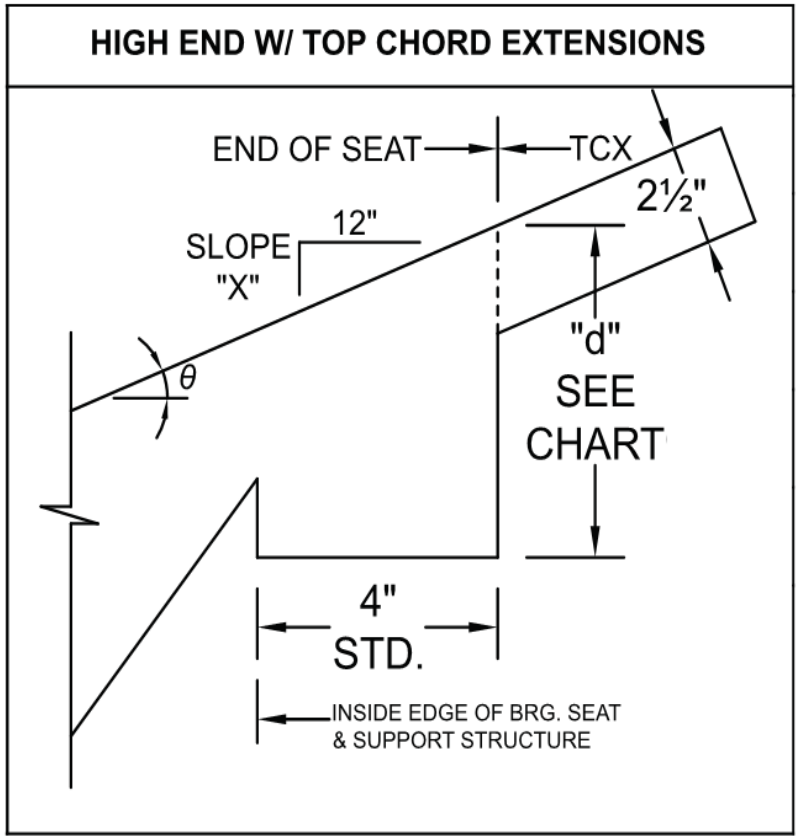




Sloped Seats

Closer look at Table 2.2-2 for **K-Series** Joists (**HIGH END**)





Sloped Seats

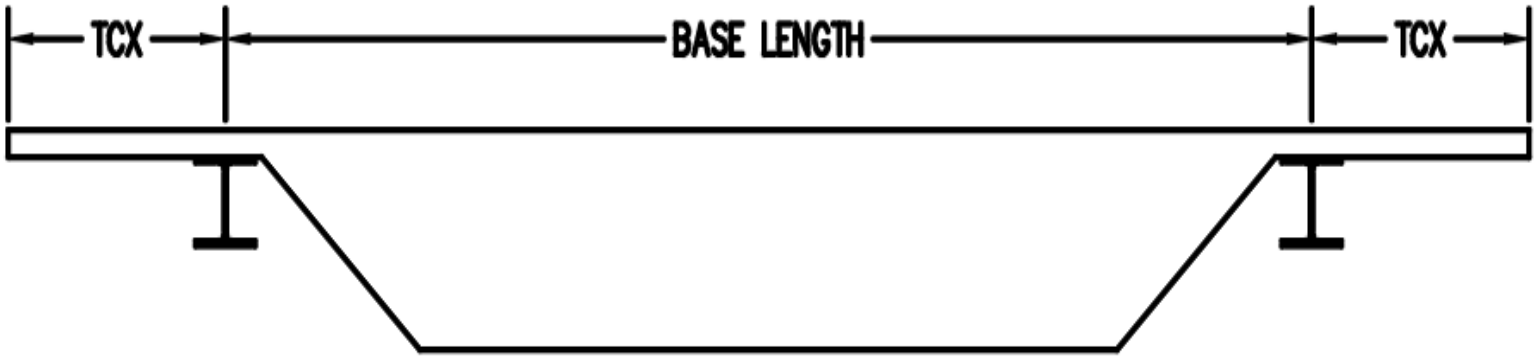
Minimum **HIGH END** seat depths:

SLOPE "X":12	MINIMUM HIGH END SEAT DEPTH "d"
3/8	3 1/2
1/2	3 1/2
1	3 1/2
1 1/2	4
2	4
2 1/2	4
3	4 1/2
3 1/2	4 1/2
4	4 1/2
4 1/2	5
5	5
5 1/2	5 1/2
6	5 1/2

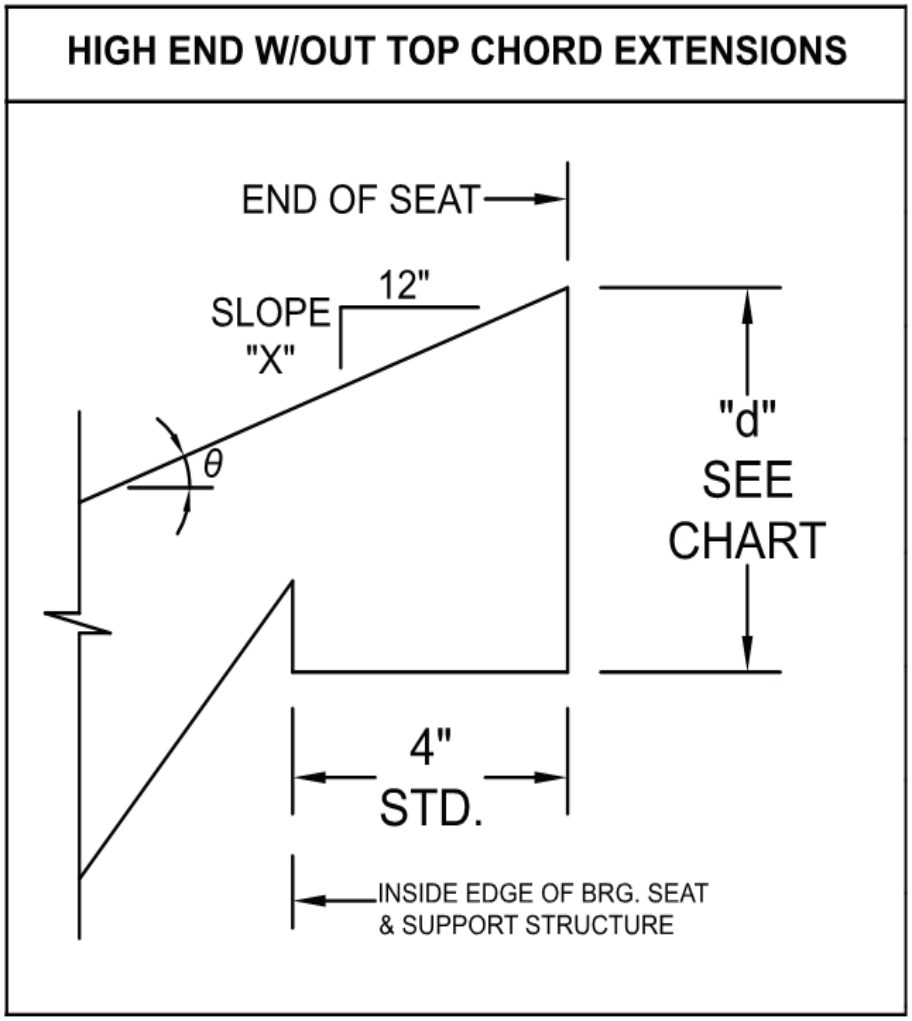
Sloped Seats

Note that the required SEAT DEPTH “d” is measured at the **end of the seat**, where the TCX begins

This is commonly referred to as the **BASE LENGTH**

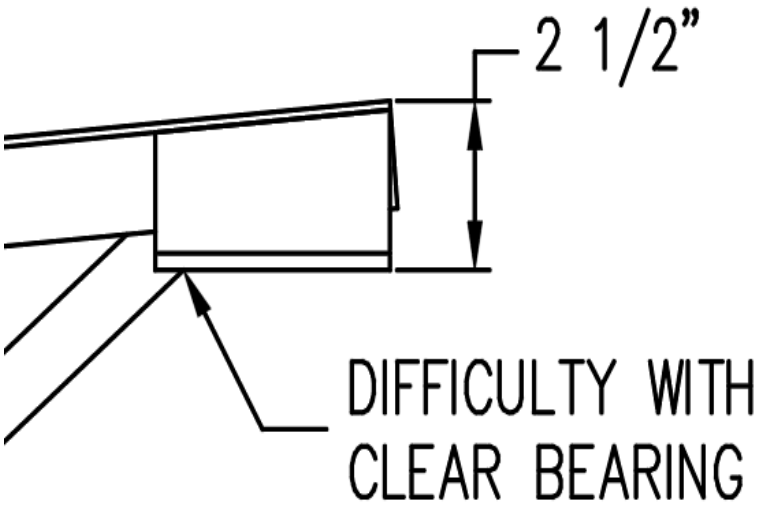


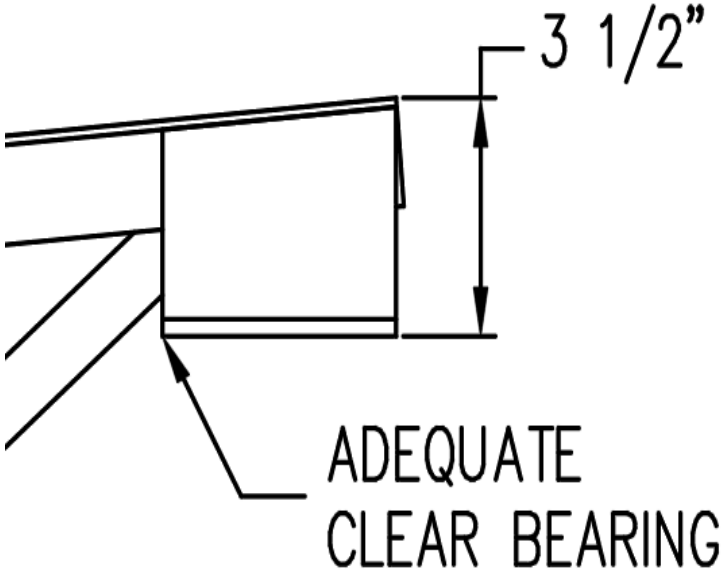
Sloped Seats



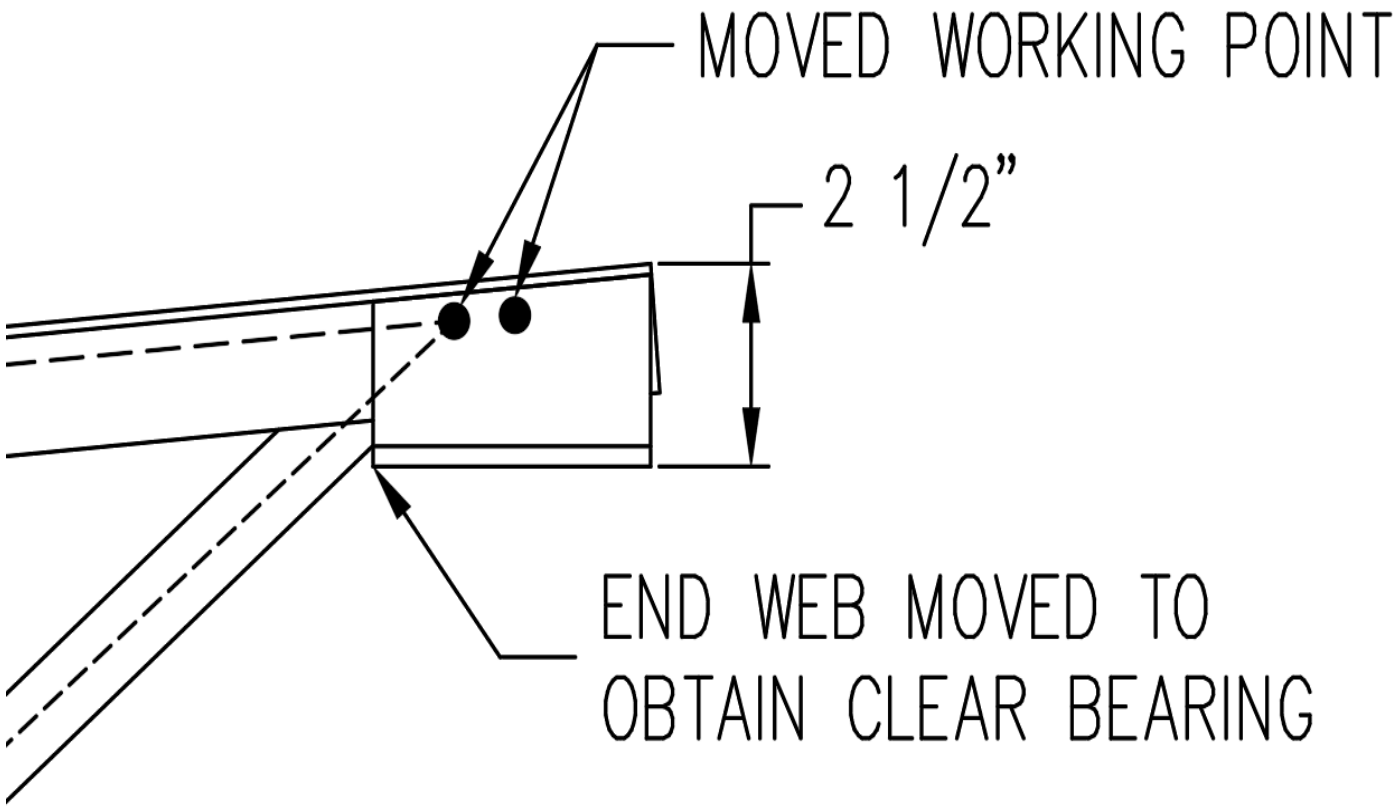
Sloped Seats

1:12 Slope at **HIGH END**





Sloped Seats

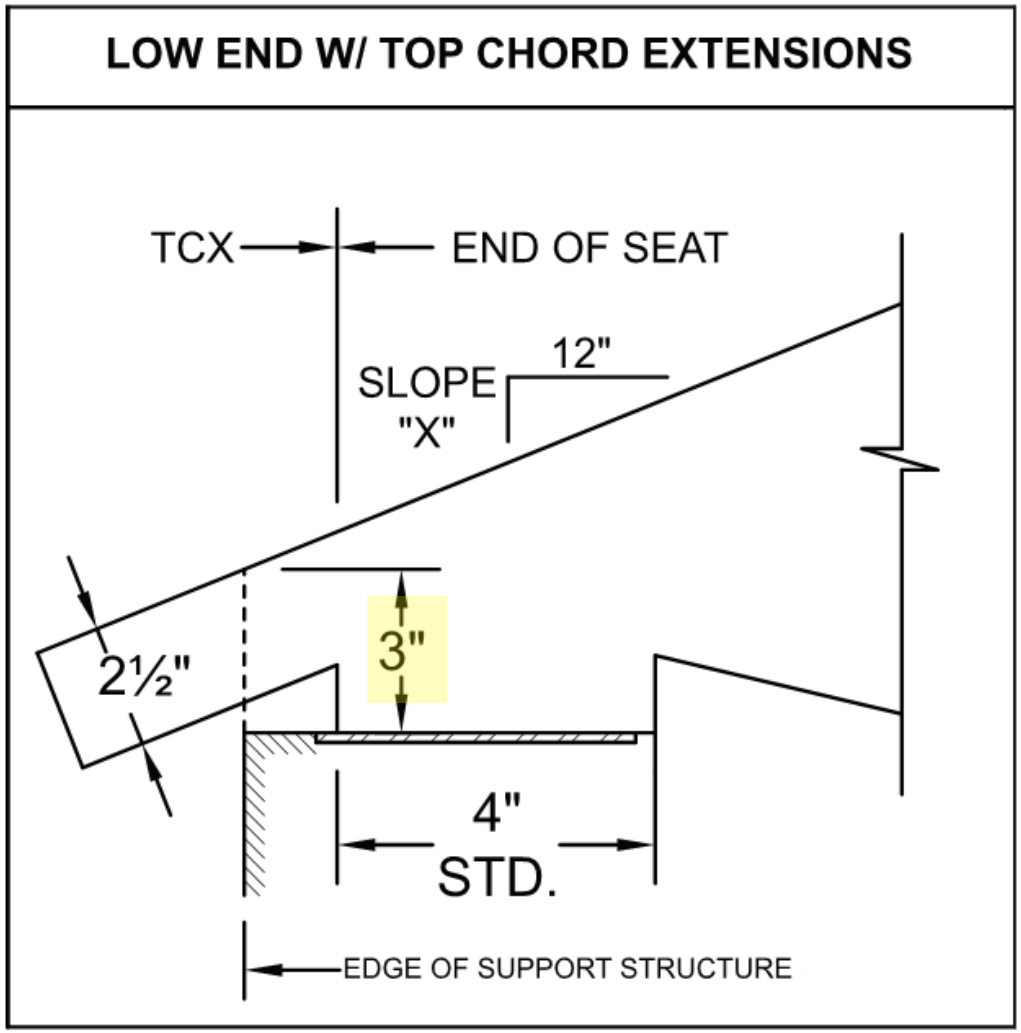


Sloped Seats

When the low end has a top chord extension (TCX), clearance must be checked at the outer edge of the support

- 3” minimum seat depth for K-Series
- 5 1/2” minimum seat depth for LH- and DLH-Series

Sloped Seats

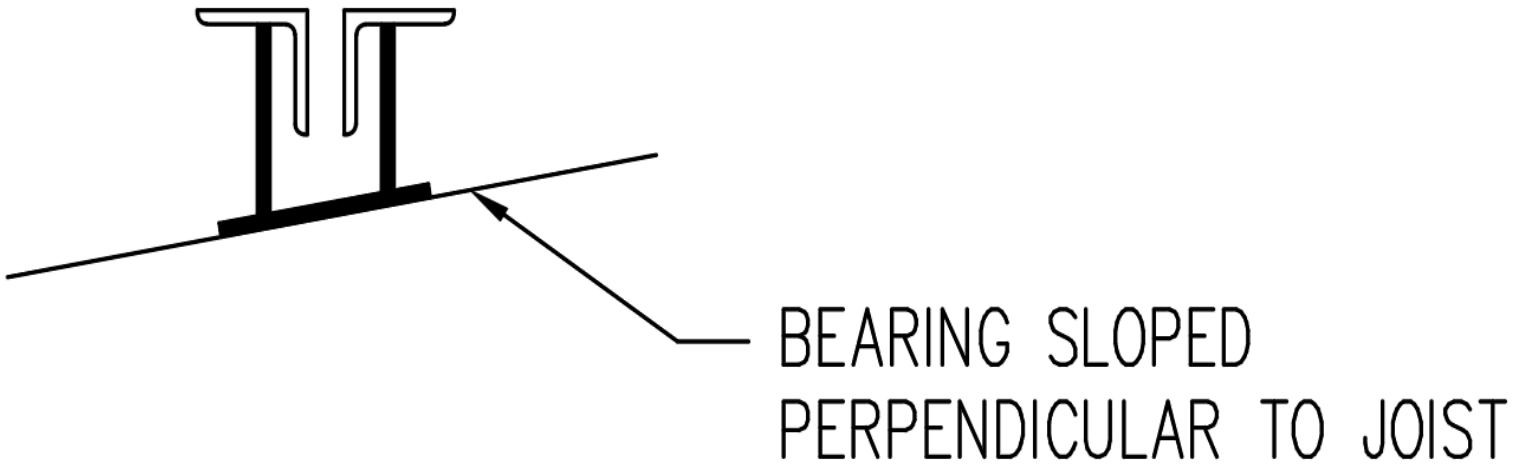


Sloped Seats

When the bearing is sloping perpendicular to the joist, **Canted Seats** may be required

Contact your preferred local Joist Manufacturer to discuss their capabilities and details

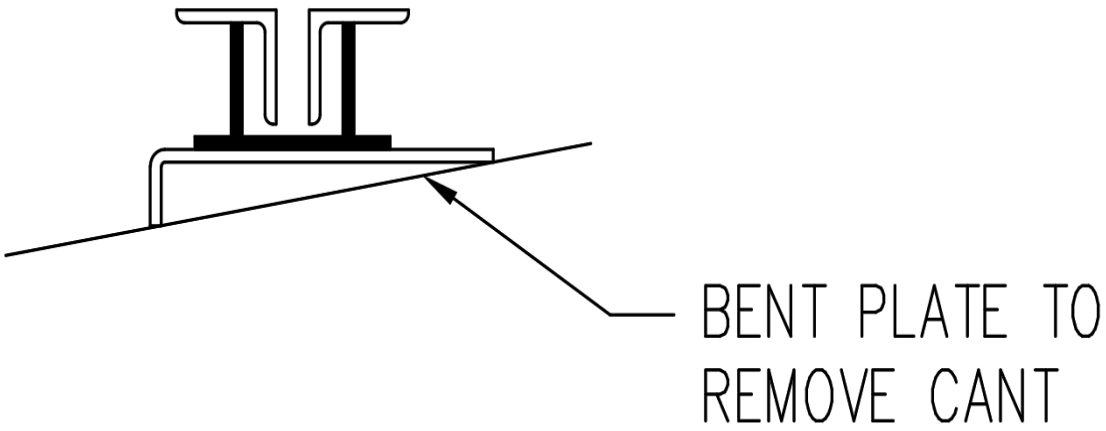
Sloped Seats



CANTED JOIST SEAT

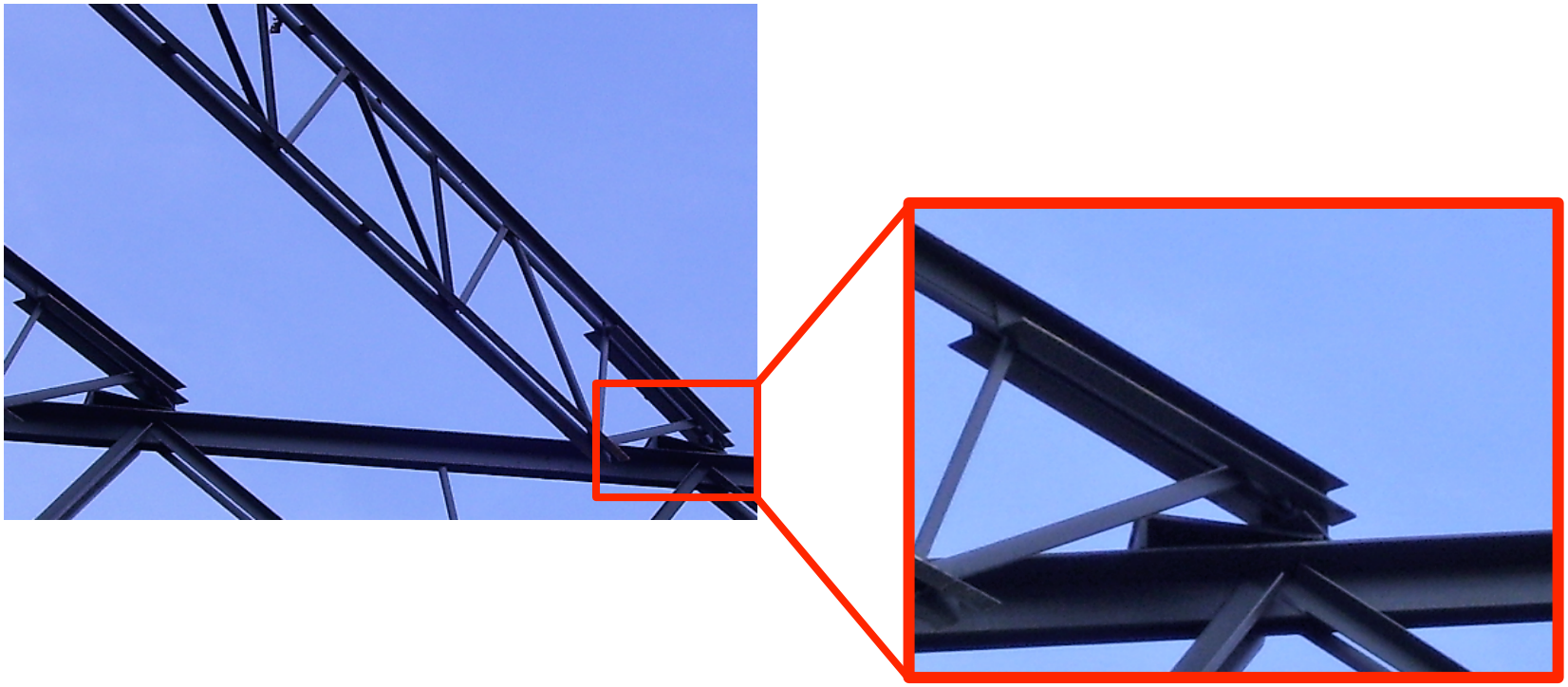
Sloped Seats

A preferred alternate solution to using Canted Seats is to install a bent plate to remove the cant



BENT PLATE UNDER
JOIST SEAT

Sloped Seats



Pitched Top Chords

Four standard types of joists with pitched top chords:

Single Pitch

TOP CHORD PITCHED ONE WAY, UNDERSLUNG

TOP CHORD PITCHED ONE WAY, SQUARE ENDS

Double Pitch

TOP CHORD PITCHED TWO WAYS, UNDERSLUNG

TOP CHORD PITCHED TWO WAYS, SQUARE ENDS

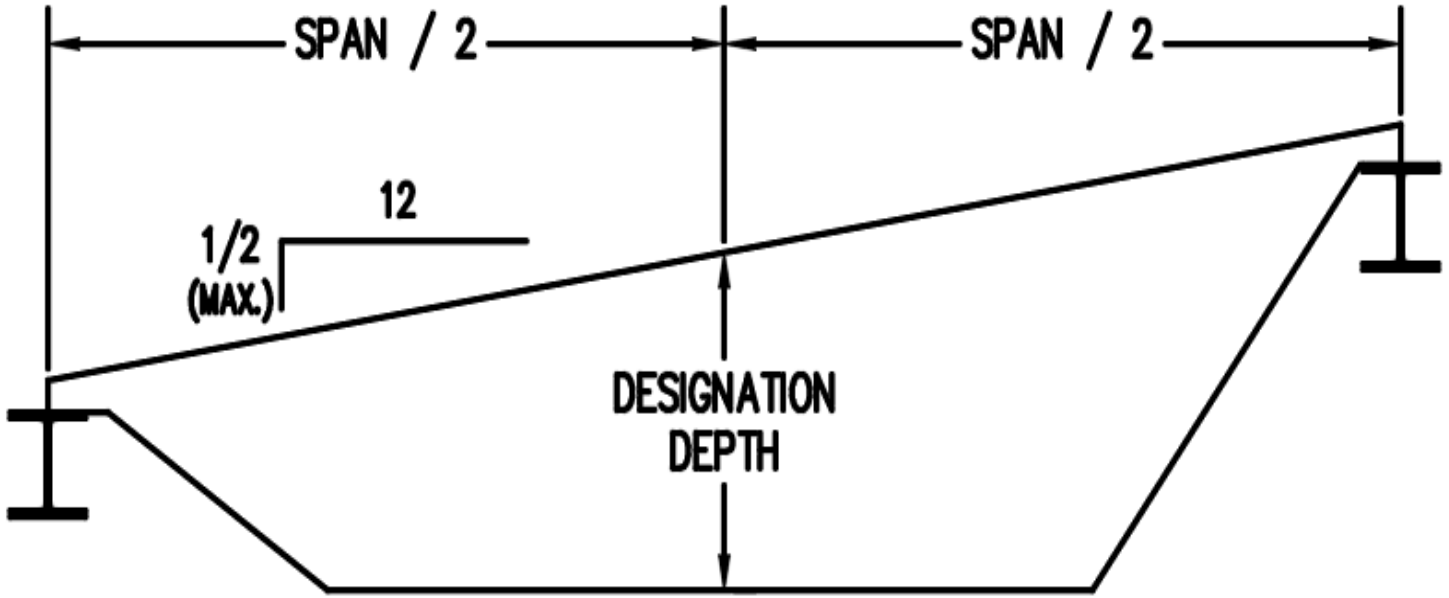
Web systems shown are examples,
and may vary depending on manufacturer

Pitched Top Chords

Steel joists with SJI designations shall **not** have a top chord pitch exceeding **1/2:12**

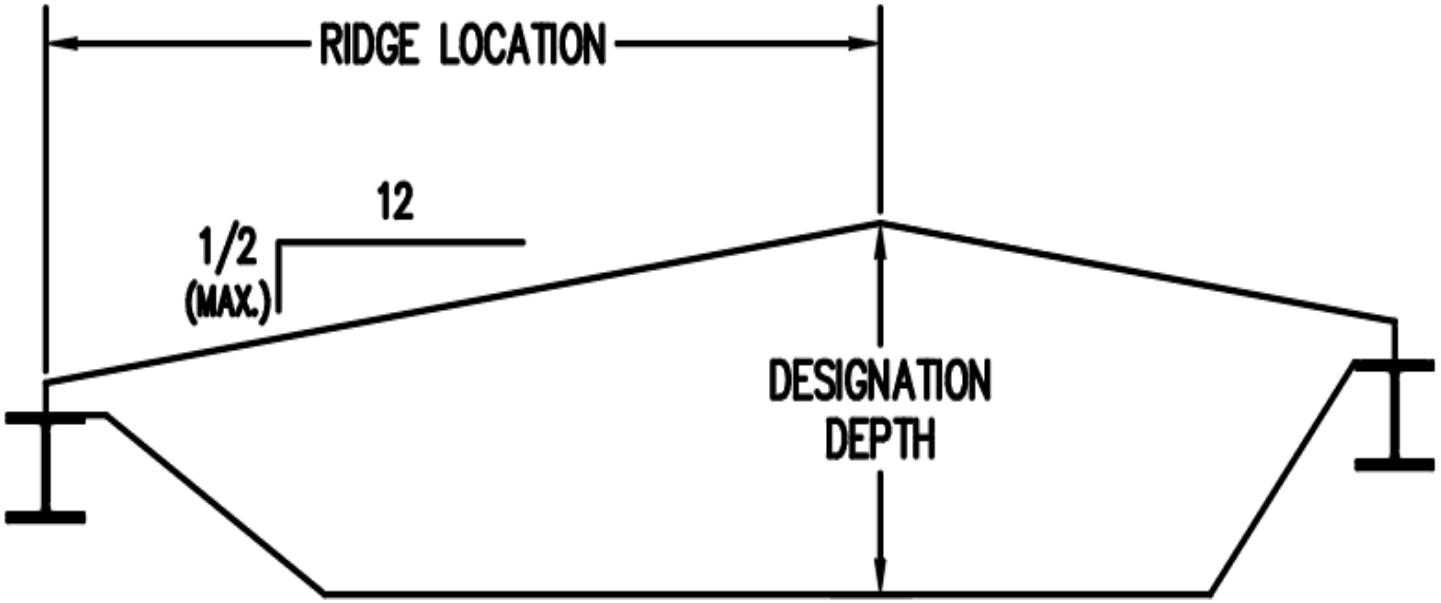
- For **Single Pitch**, the designation depth shall be at mid-span
- For **Double Pitch**, the designation depth shall be at the ridge

Pitched Top Chords



SINGLE PITCH JOIST

Pitched Top Chords



DOUBLE PITCH JOIST

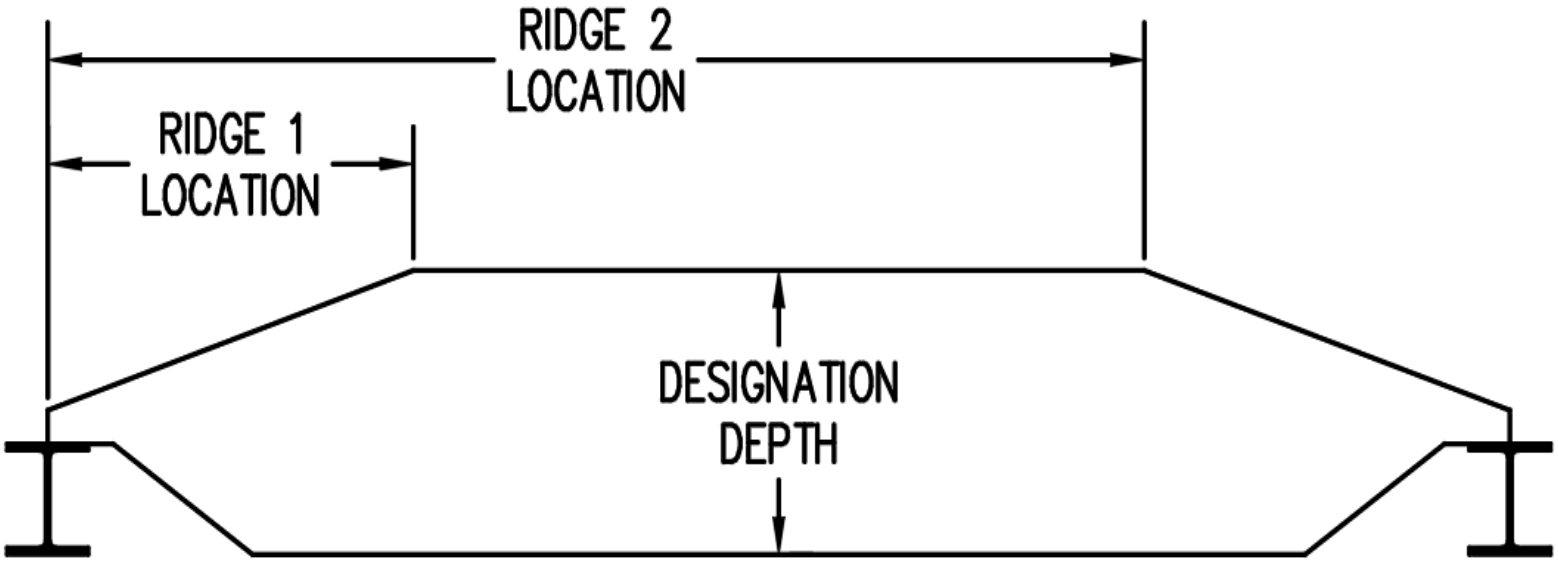
Pitched Top Chords

Many Joist Manufacturers can provide more than two pitched chords

Most common is **Triple Pitch**

Contact your preferred local Joist Manufacturer to discuss their capabilities

Pitched Top Chords



TRIPLE PITCH JOIST

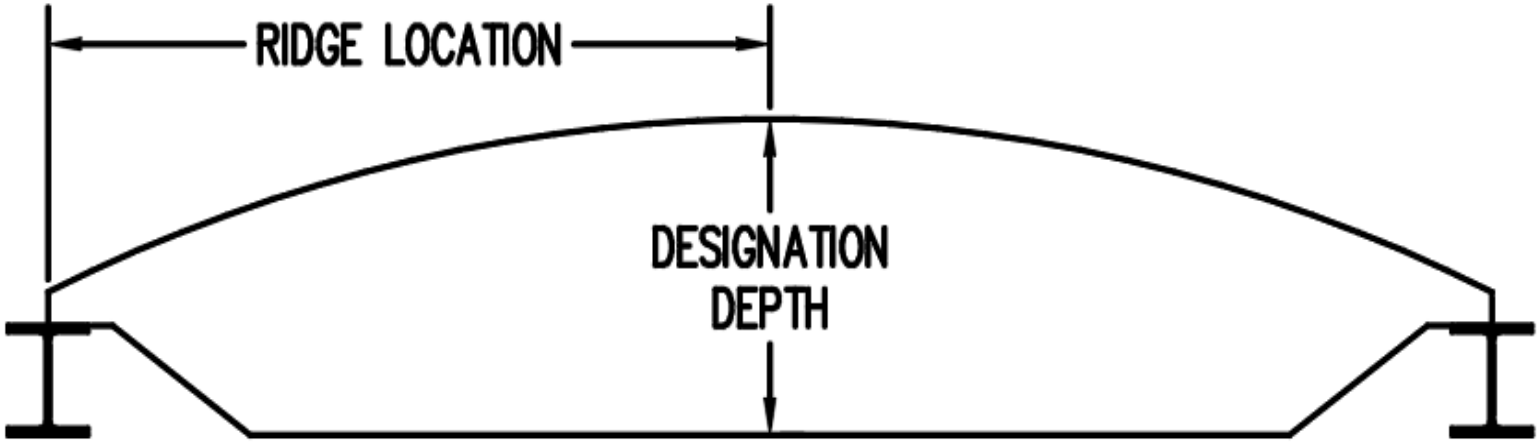
Pitched Top Chords

Special Profile Joists

There are four generally accepted Special Profiles:

- Bowstring
- Arch
- Gable
- Scissor

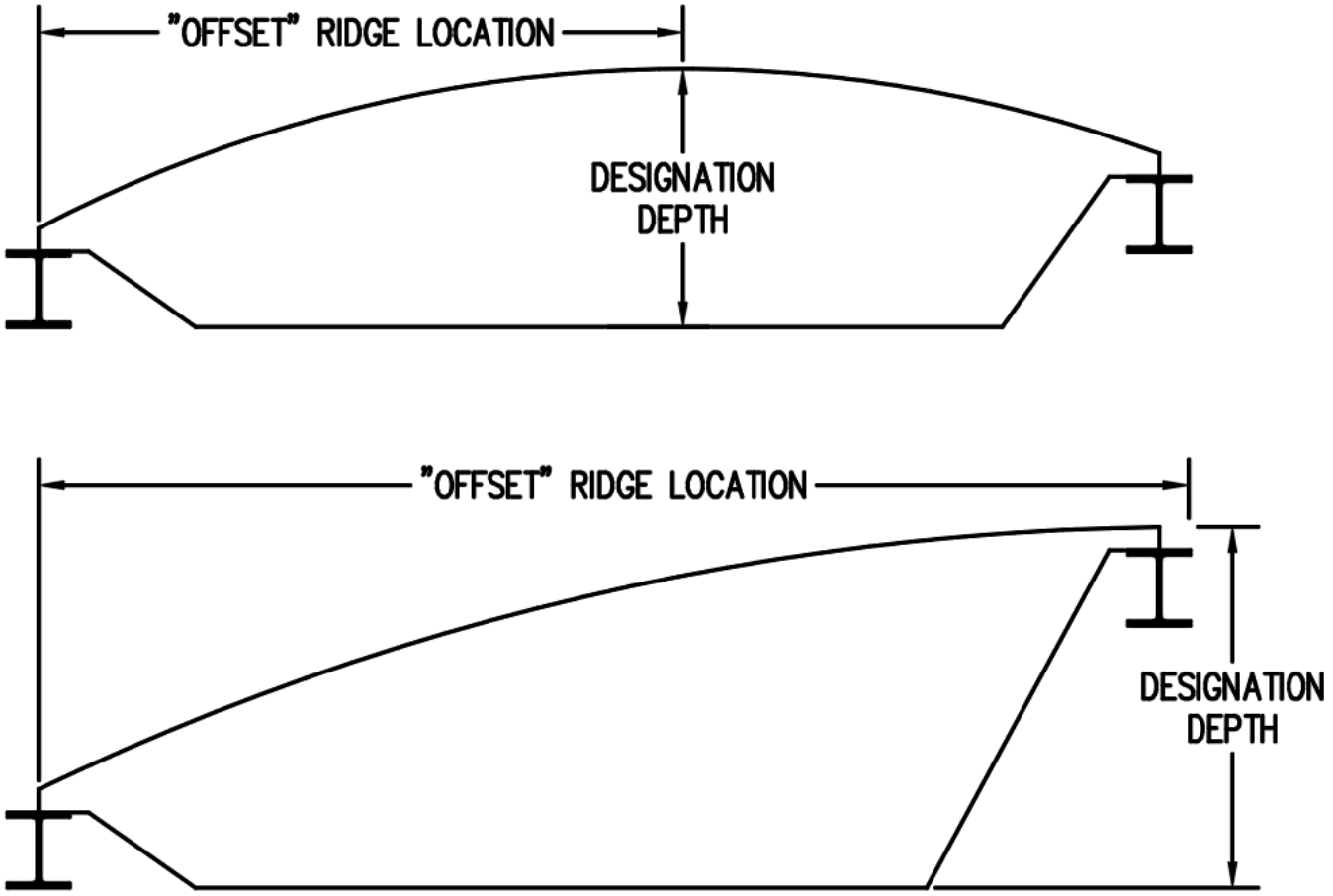
Special Profile Joists



BOWSTRING JOIST

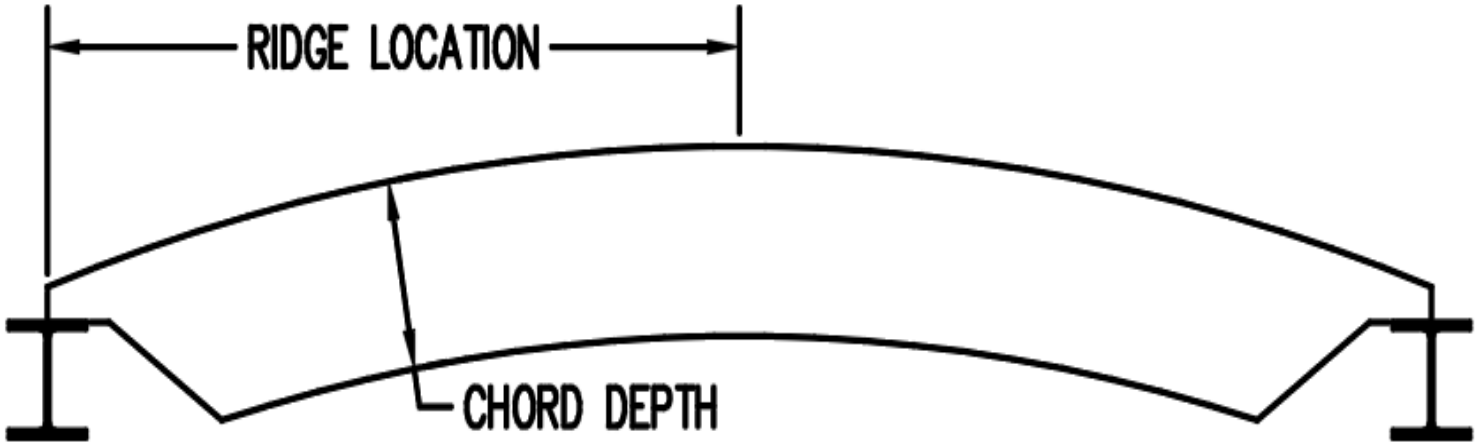
Special Profile Joists

Special Profile Joists



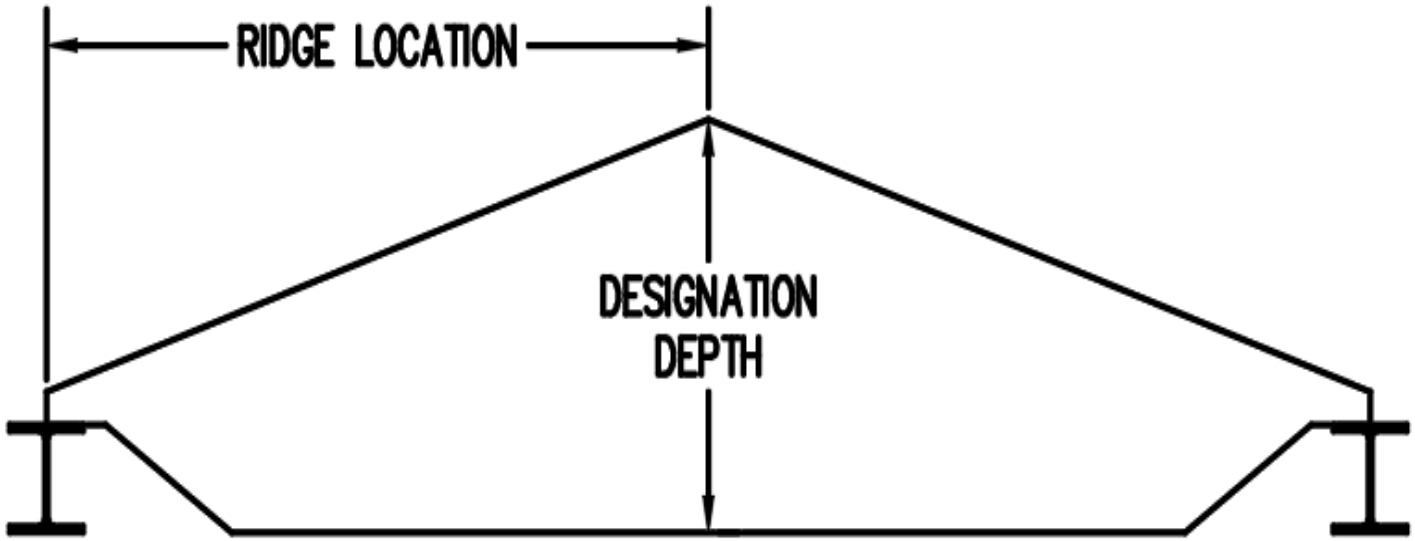
OFFSET RIDGE BOWSTRING JOIST

Special Profile Joists



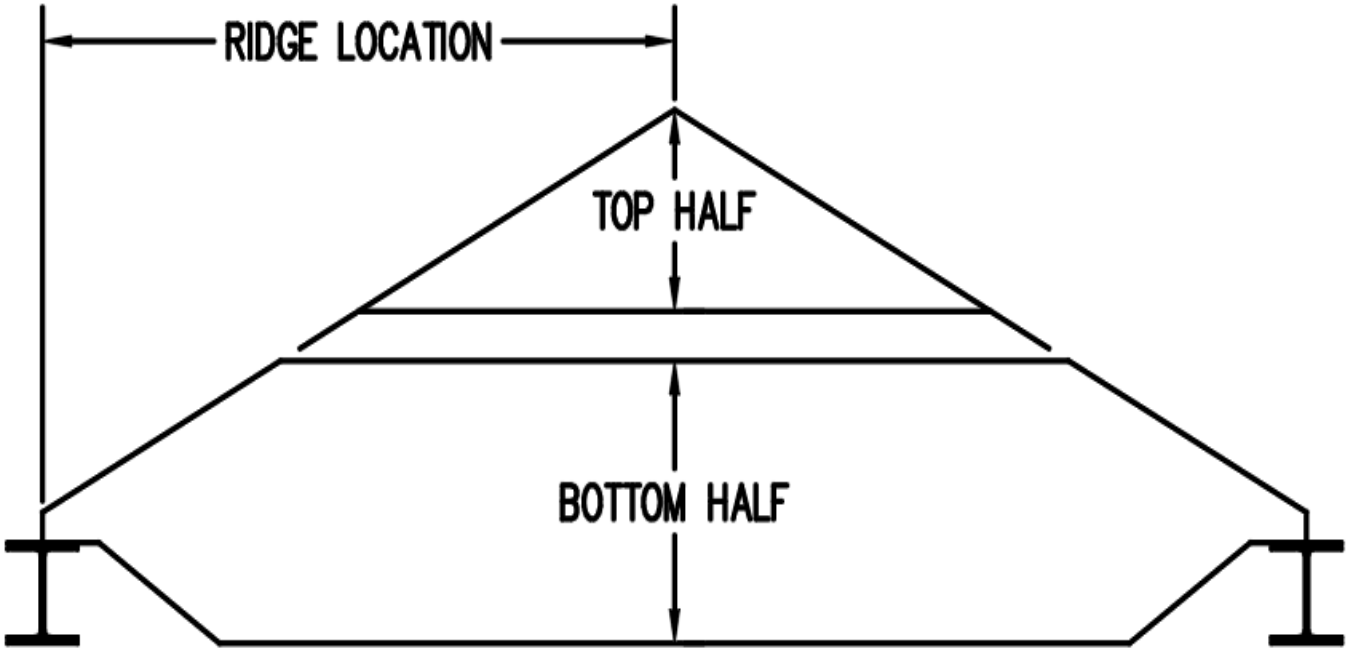
ARCH JOIST

Special Profile Joists



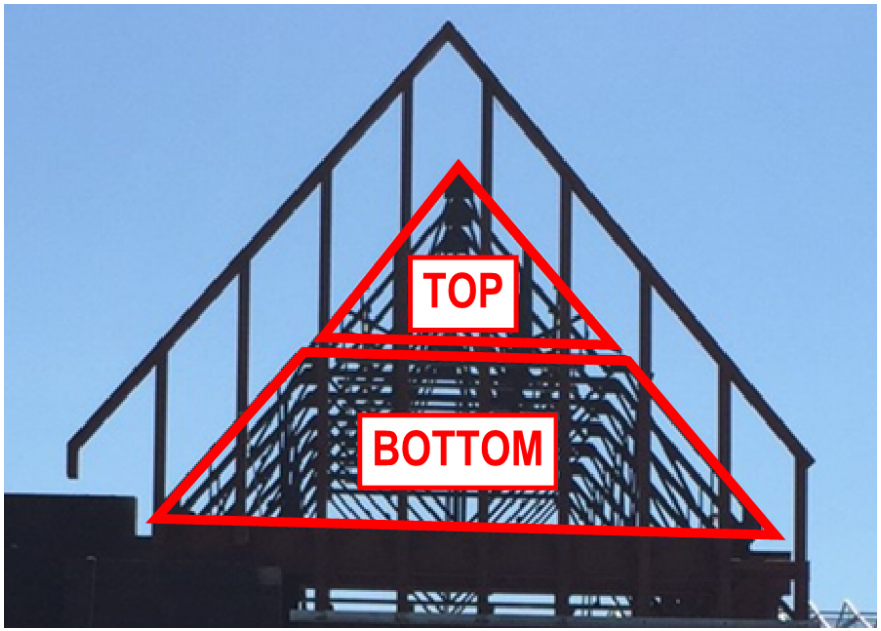
GABLE JOIST

Special Profile Joists



"PIGGY BACK" GABLE JOIST

Special Profile Joists



Special Profile Joists

Special Profile Joists

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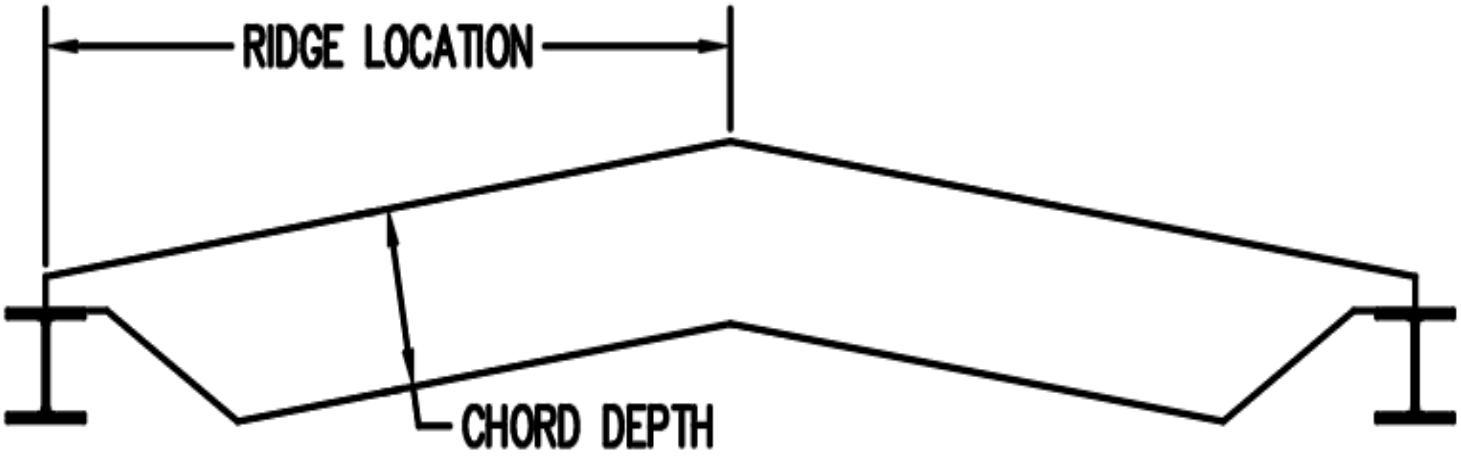
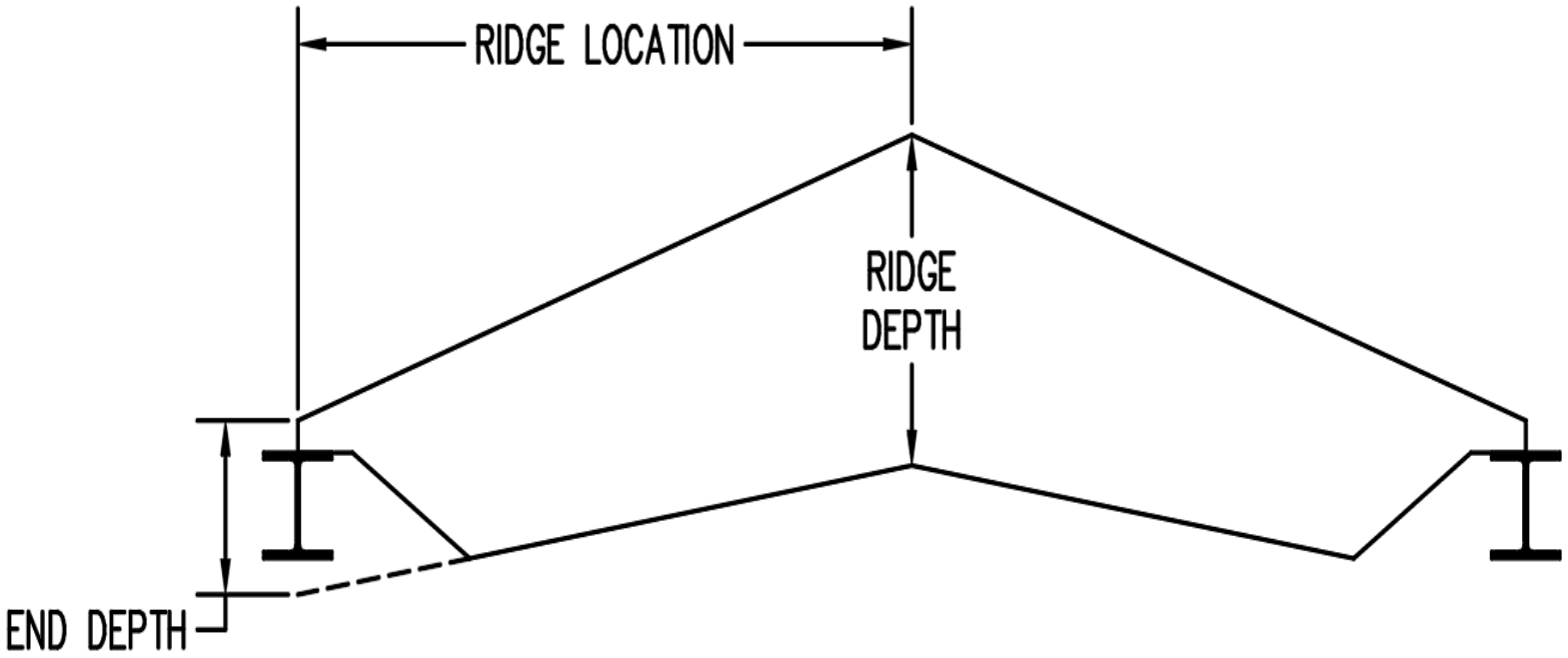
Special Profile Joists



SCISSOR JOIST

Special Profile Joists



COMPOUND SCISSOR JOIST

Special Profile Joists

Of Special Profile Joists, **Gable Joists** are typically the most cost effective to manufacture

Scissor or Arch Joists should only be used if the additional clearance is needed below the joist, often for aesthetic reasons

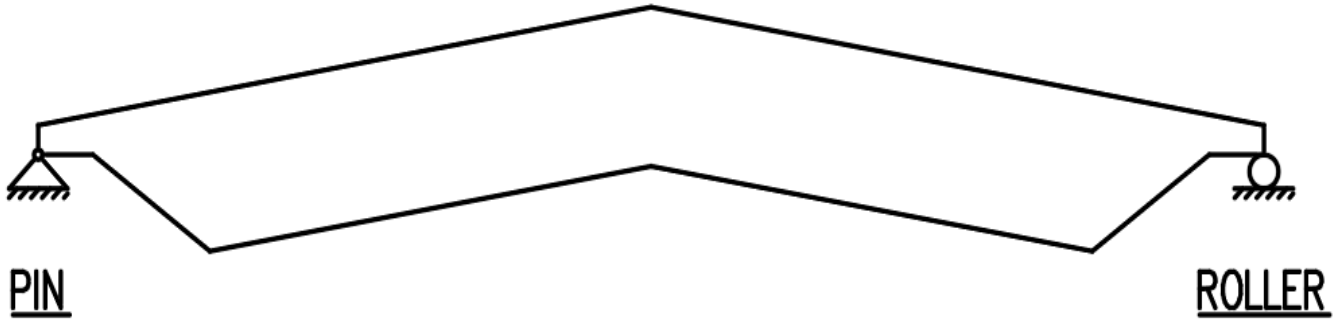
Special Profile Joists

When using Scissor or Arch Joists, there is a…

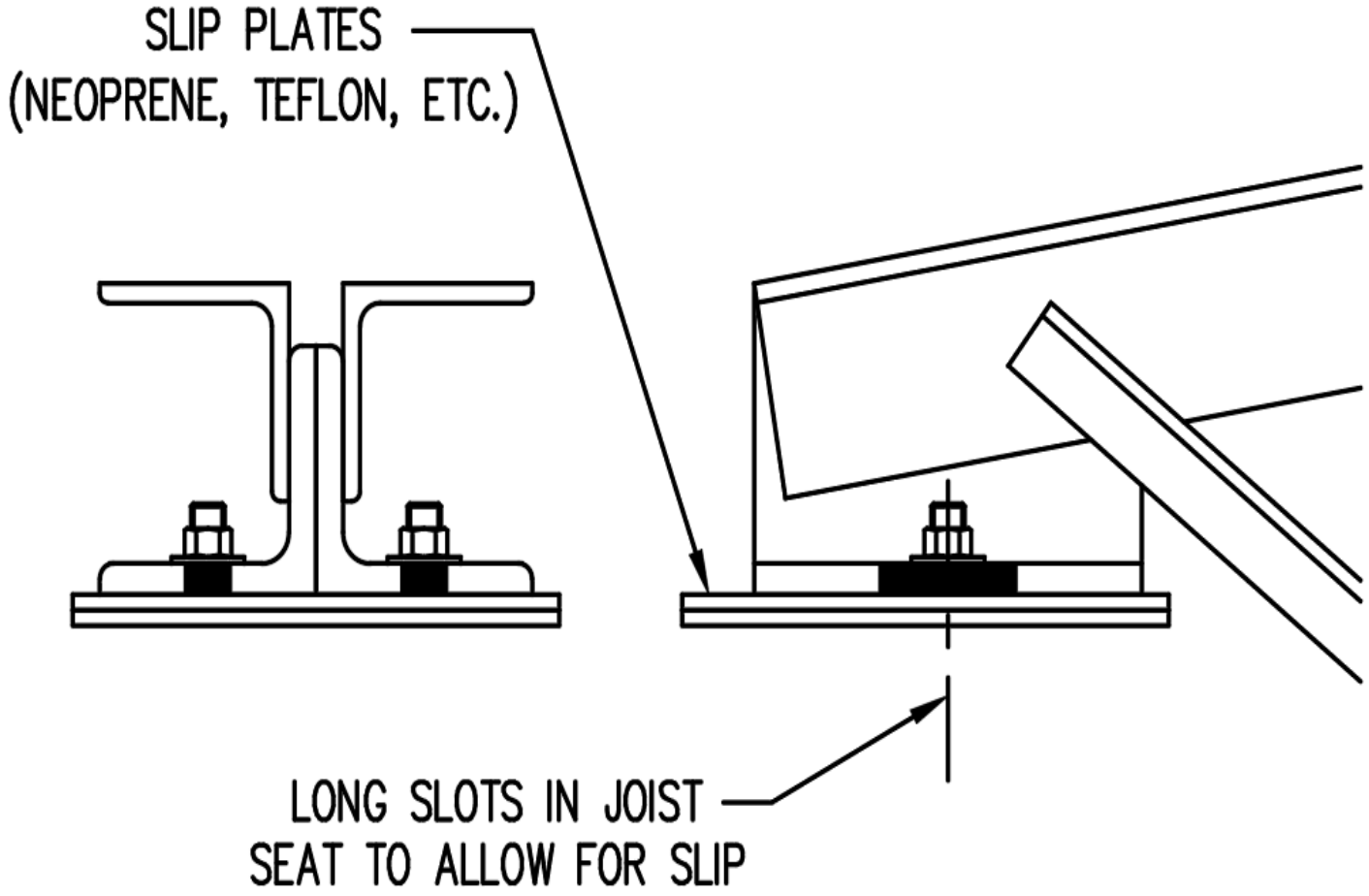
Special Profile Joists

Scissor and Arch Joists may create a horizontal reaction on the structure

To remove this **thrust force**, a slip connection should be used at one end (roller support)

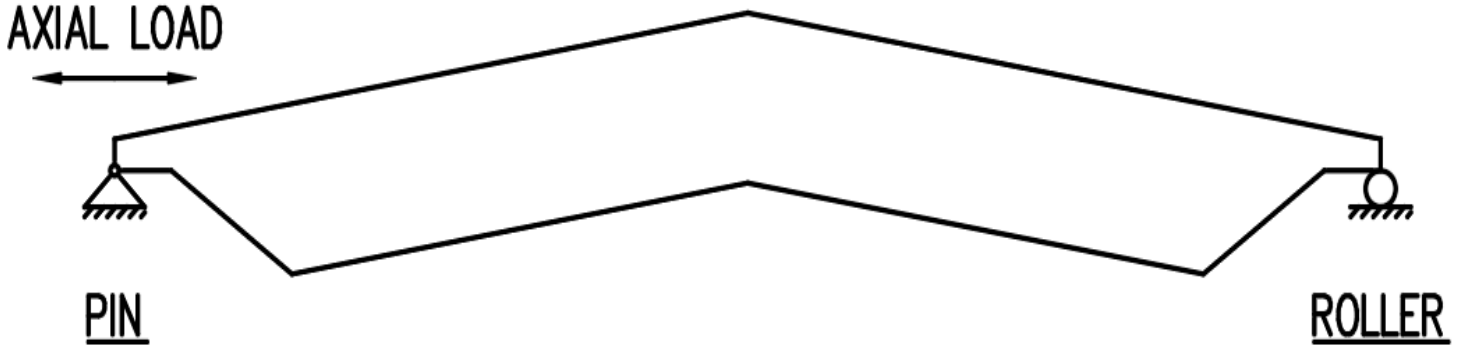


Special Profile Joists



Special Profile Joists

Note that diaphragm forces collected in the joist top chord must transfer through the pinned end of the joist



Special Profile Joists

Special Profiles Joists are typically fabricated with:

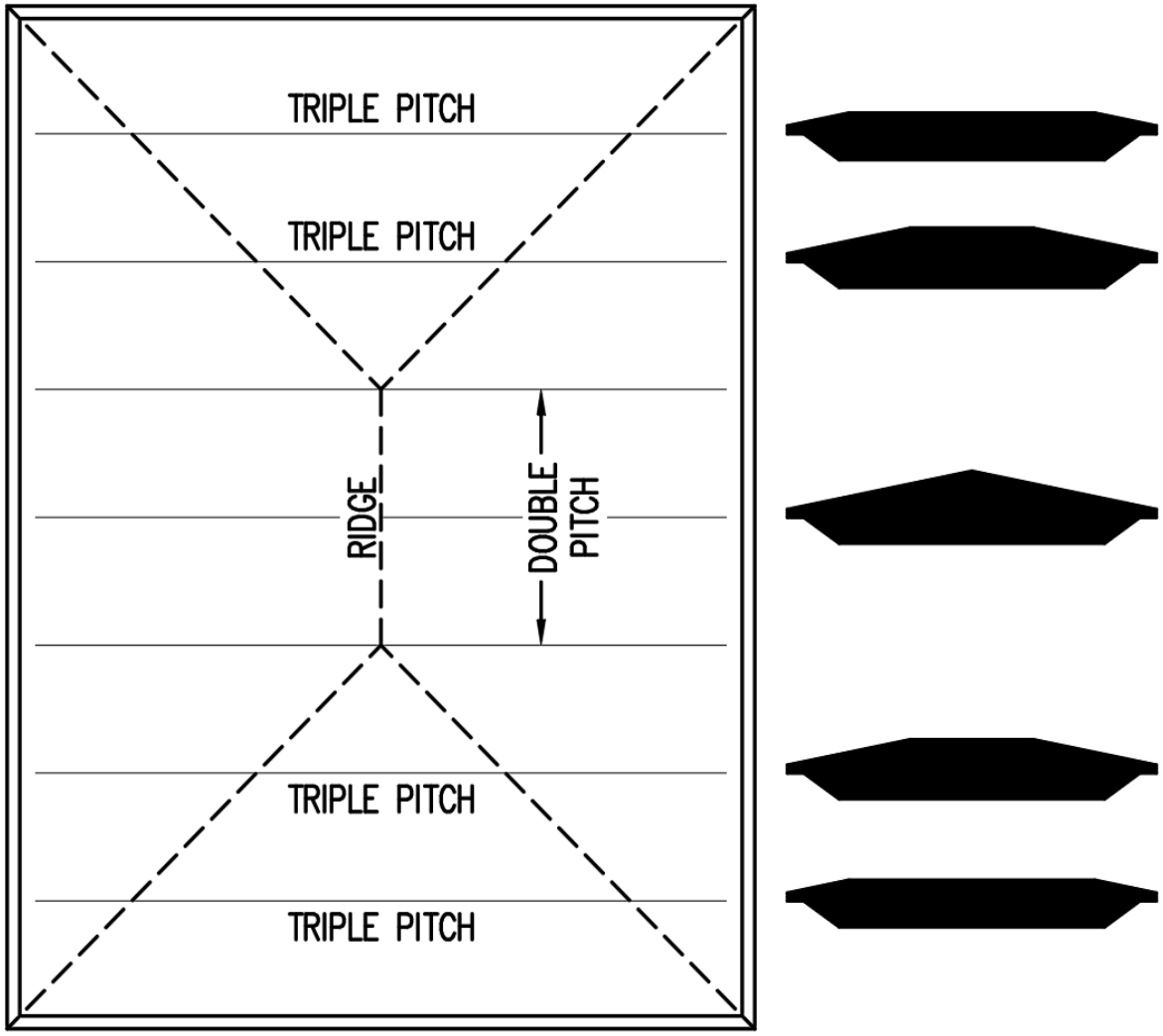
NO CAMBER

Joists in a Hip Roof

Using Steel Joists in a hip roof can be an economical option

This is most commonly done using **Double** and **Triple Pitch** Steel Joists

Joists in a Hip Roof

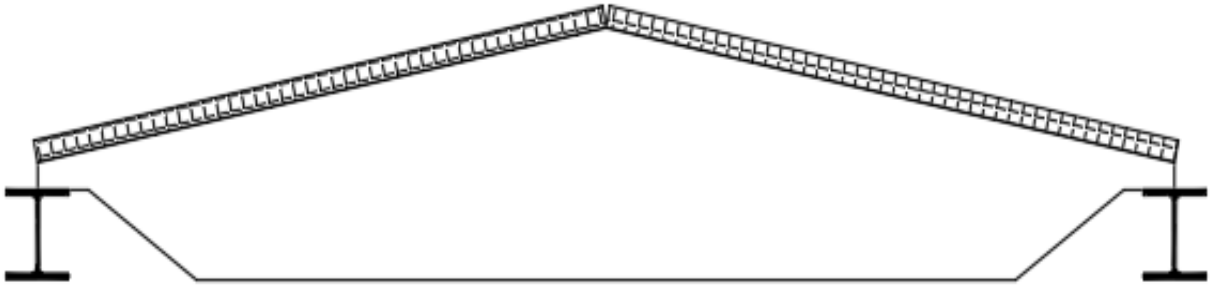


Joists in a Hip Roof

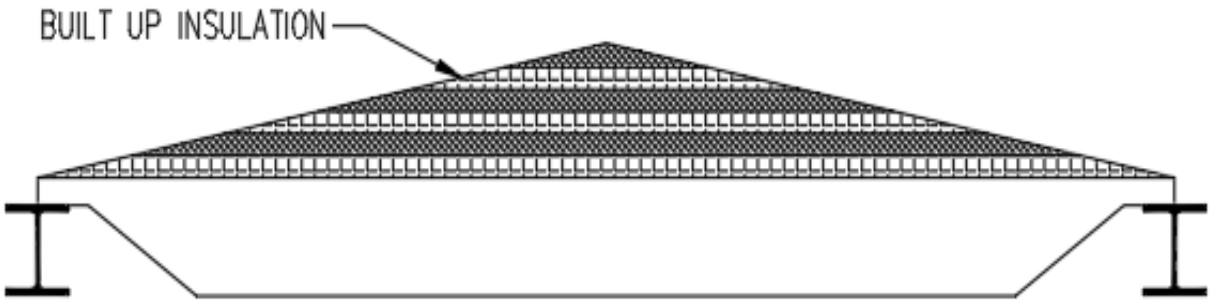
This method can be used with low slope, such as often done for drainage

When the building shape is simple, this can be more economical than building up insulation

Joists in a Hip Roof



PITCHED TOP CHORD

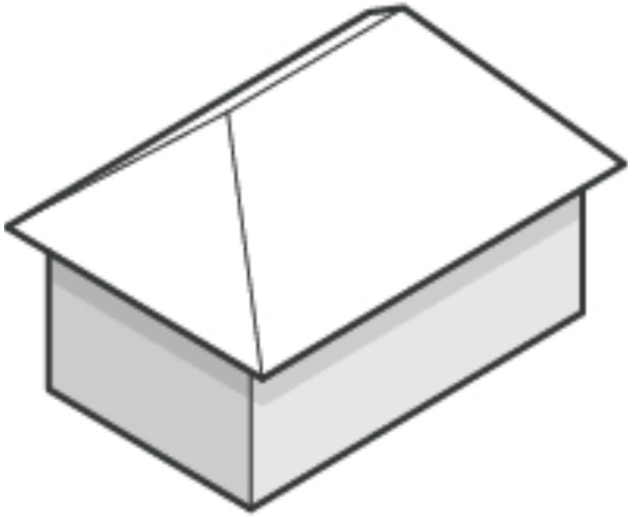


FLAT TOP CHORD

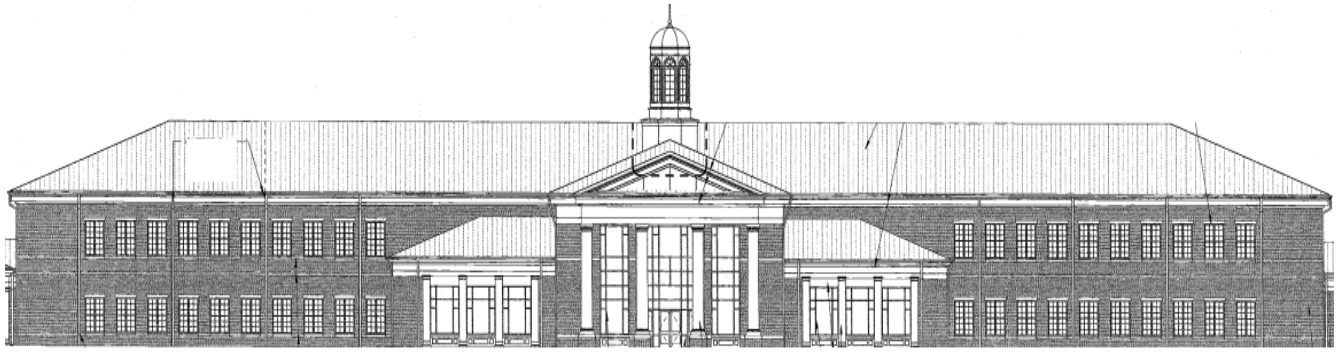
Joists in a Hip Roof

- Joists can also be used for greater sloped hip roofs

- This is common in schools, particularly over gymnasiums and auditoriums



Joists in a Hip Roof



Steel Joists used for 4:12 Hip Roof on School

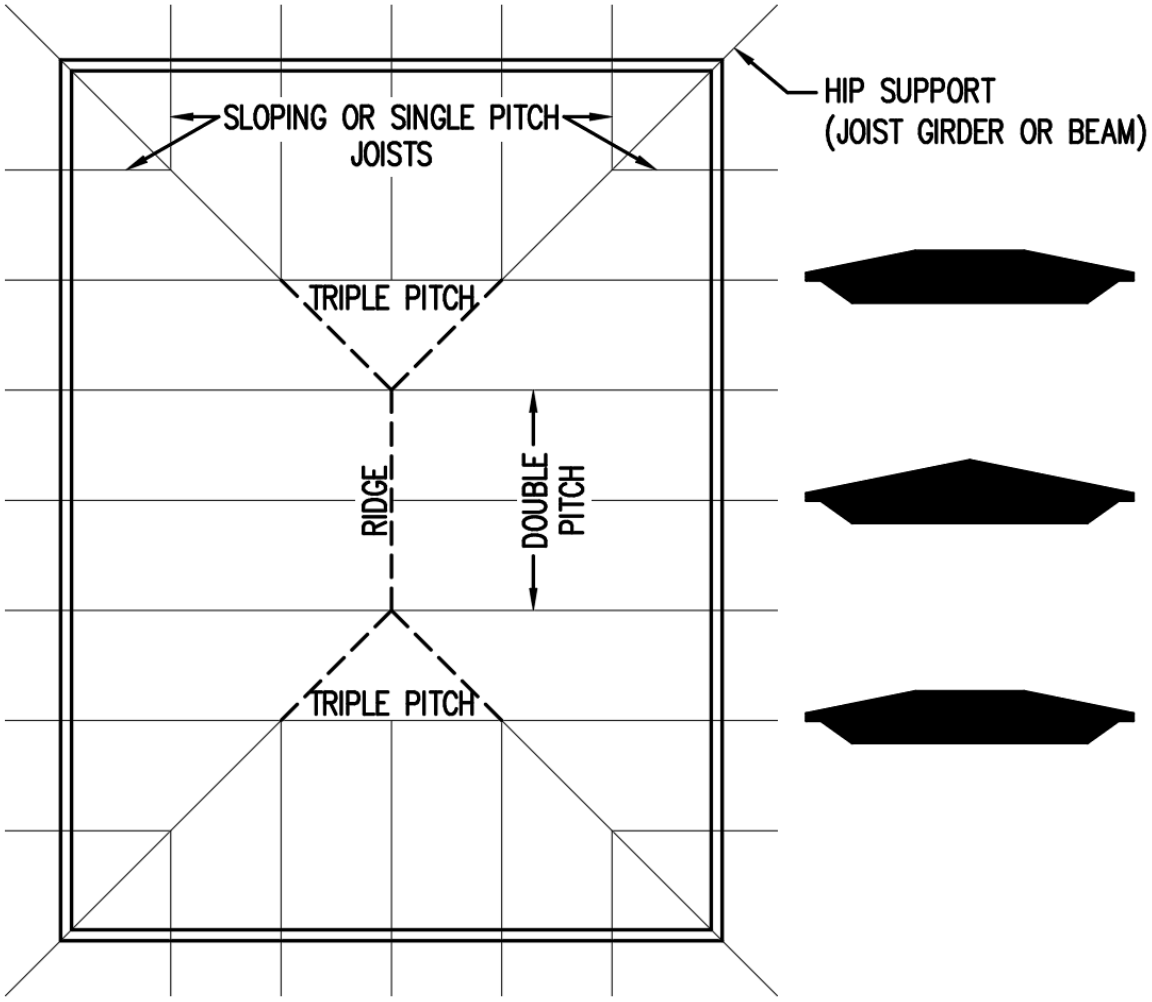
Joists in a Hip Roof

- When roof overhangs are needed, Steel Joists can be turned 90 degrees at building ends

- These bear on a **Hip Support** member, which can be a Joist Girder or Beam

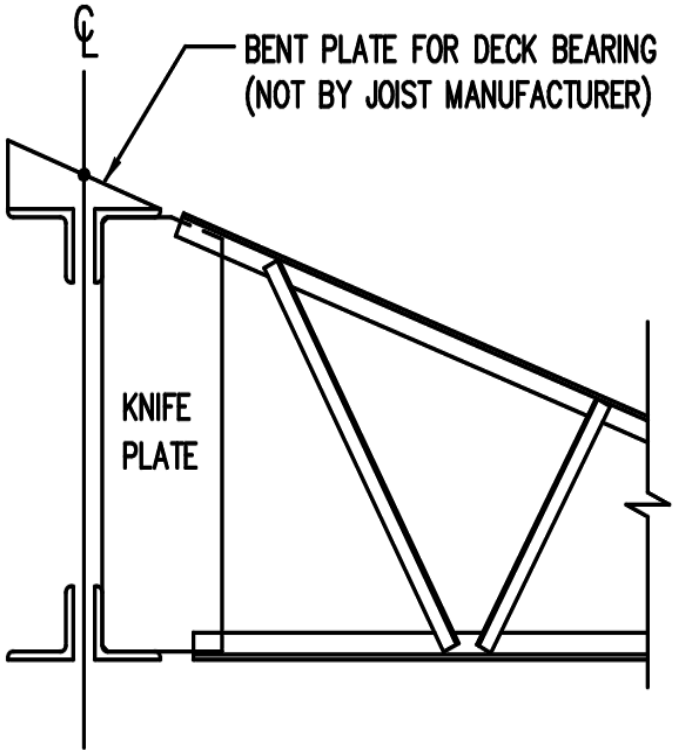
- Top chord extensions create the overhang

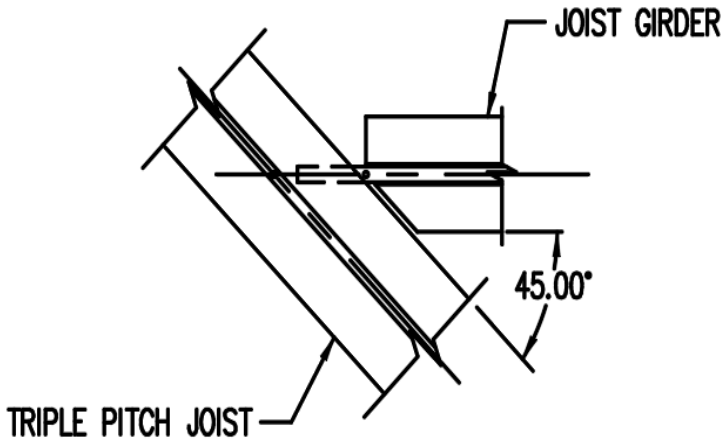
Joists in a Hip Roof



Joists in a Hip Roof

- Coordination is required at connection of **Hip Support** member to **Triple Pitch** Joist



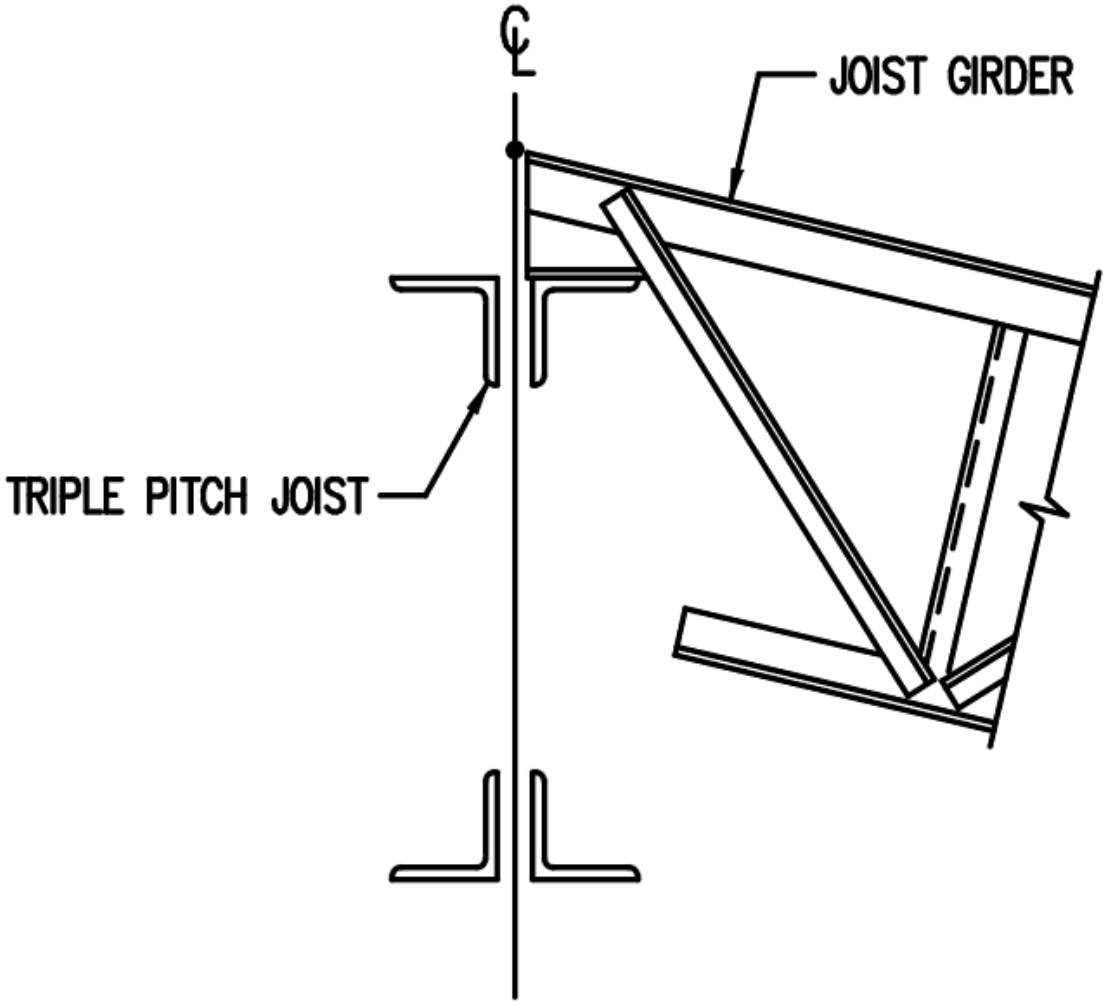


Joists in a Hip Roof

- A simpler solution is to bear the **Hip Support** member on top of the **Triple Pitch** Joist

- Contact your preferred local Joist Manufacturer to discuss connection details and preferences

Joists in a Hip Roof



Polling Question #1

In order to eliminate the horizontal thrust force from a scissor joist, you should:

A. Weld both ends of the joist to the structure

B. Use a slip connection at one end of the joist

C. Use a slip connection at both ends of the joist

Nothing Flat About Steel Joists and Steel Deck On a Pitched Roof

- Curved Steel Deck
- Sloped Roof Planes
- Attaching Deck on Sloped Surfaces
- Uplift and Diaphragm Shear

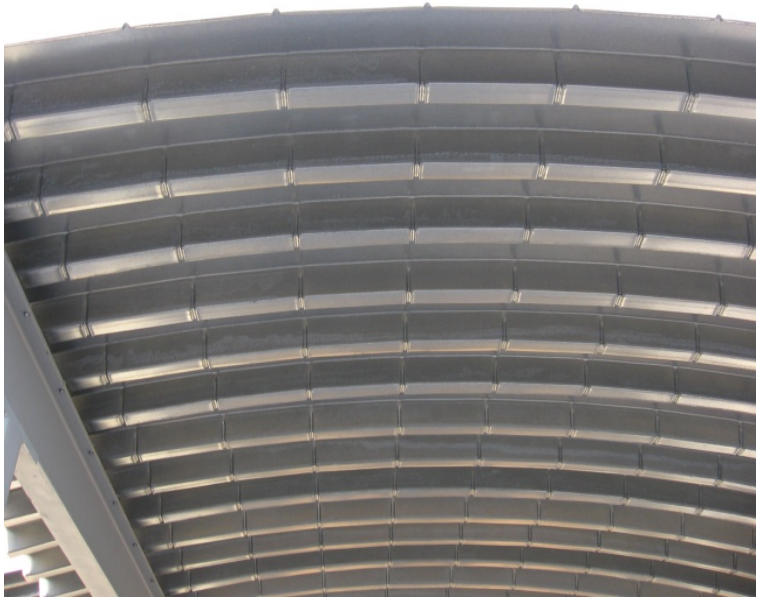
Nothing Flat About Steel Roof Deck

1-1/2” WR Deck on Dome

Source: Floline

Can Steel Roof Deck Be Curved?

The “Easy Way”



The “Hard Way”

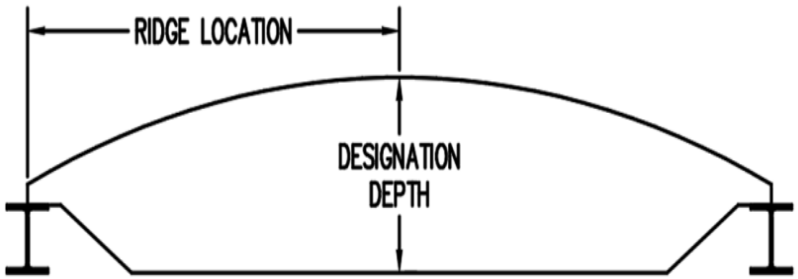
Source: New Millennium

Can Steel Roof Deck Be Curved?

Weak Direction

B DECK

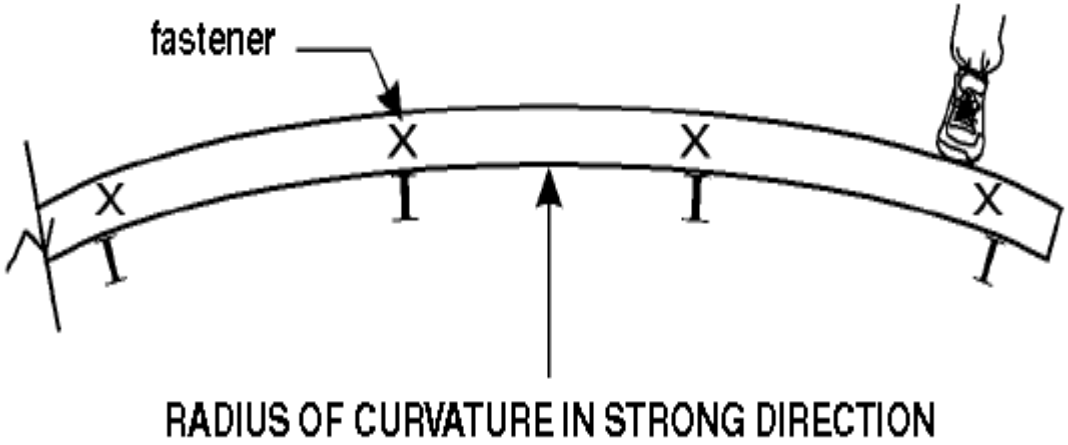
N DECK



BOWSTRING JOIST

Can Steel Roof Deck Be Curved?

Strong Direction Field Bending



Approx. 75plf to bend

Fasteners in every rib at end of panel

Source: Canam

Can Steel Roof Deck Be Curved?

Strong

Direction

Field Bending

Limit sum of

Residual stress

And flexural

Stress to

0.66 Fy

B Deck

Gage	Smallest Support Spacing				
	4'0"	5'0"	6'0"	7'0"	8'0"
22	185/12.6	148/15.7	123/18.9		
20	237/10.0	189/12.5	158/15.0	135/17.5	
18	308/7.5	246/9.4	206/11.2	176/13.1	154/15.0
16	389/5.8	313/7.3	260/8.8	223/10.2	195/11.7

Minimum Radius of Curvature (ft.) / Residual Stress (ksi)

N Deck

Gage	Smallest Support Spacing				
	9'0"	10'0"	11'0"	12'0"	13'0"
22	373/13.5	336/15.0	306/16.5	280/18.0	259/19.5
20	464/10.6	418/11.8	380/12.9	348/14.1	322/15.3
18	615/7.7	553/8.6	503/9.4	461/10.3	426/11.1
16	775/6.0	697/6.7	633/7.3	581/8.0	536/8.7

Minimum Radius of Curvature (ft.) / Residual Stress (ksi)

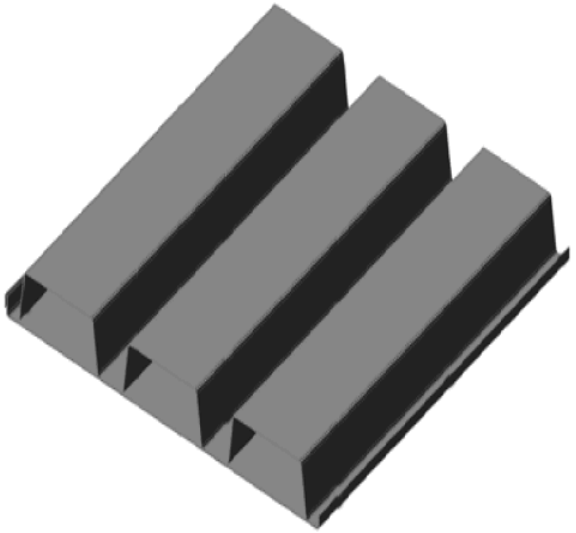
- Source: Canam

Can Steel Roof Deck Be Curved?

Strong Direction

Tighter radius can be shop crimped by some manufacturers and secondary suppliers

Cellular Deck usually cannot be crimped



Can Steel Roof Deck Be Curved?

Crimped
condition shown

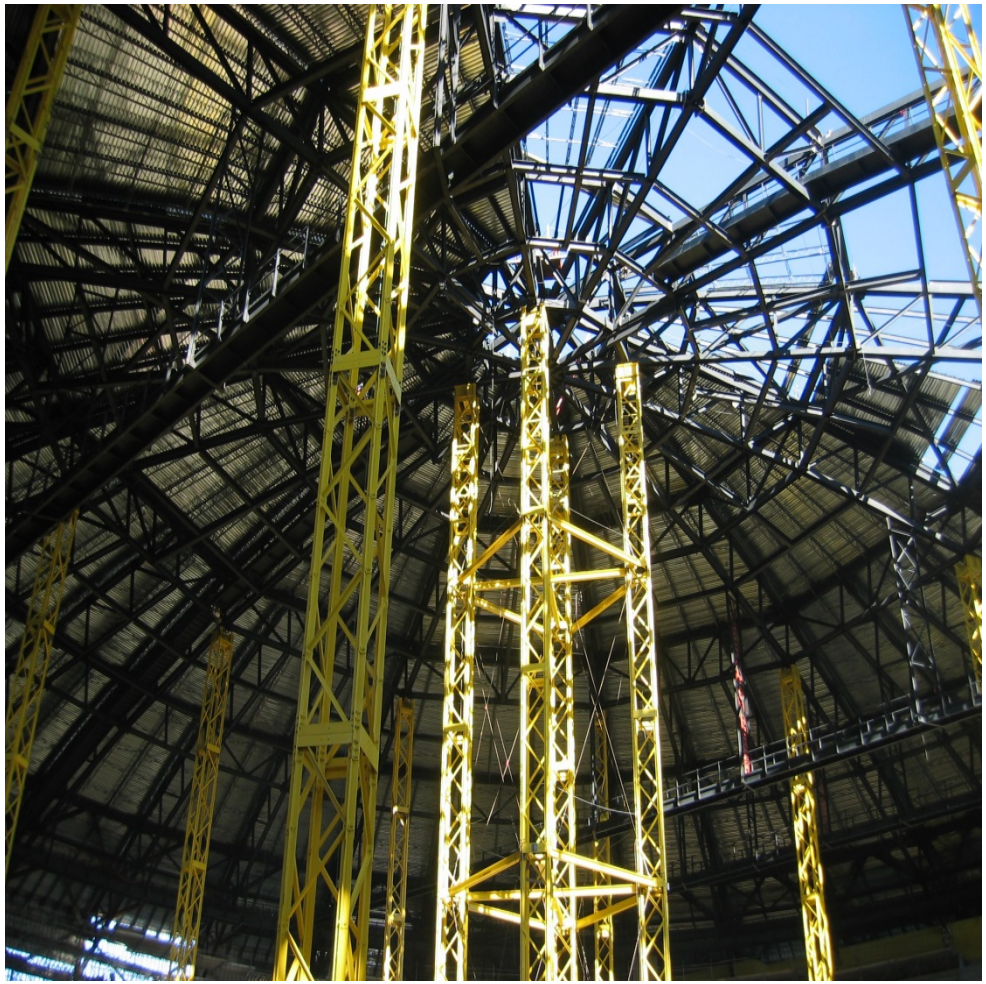
Minimum radius
without crimps
= 24 foot

Source: Canam

Can Steel Roof Deck Be Curved?

Source: Epic Metals

Can Steel Roof Deck Be Curved?



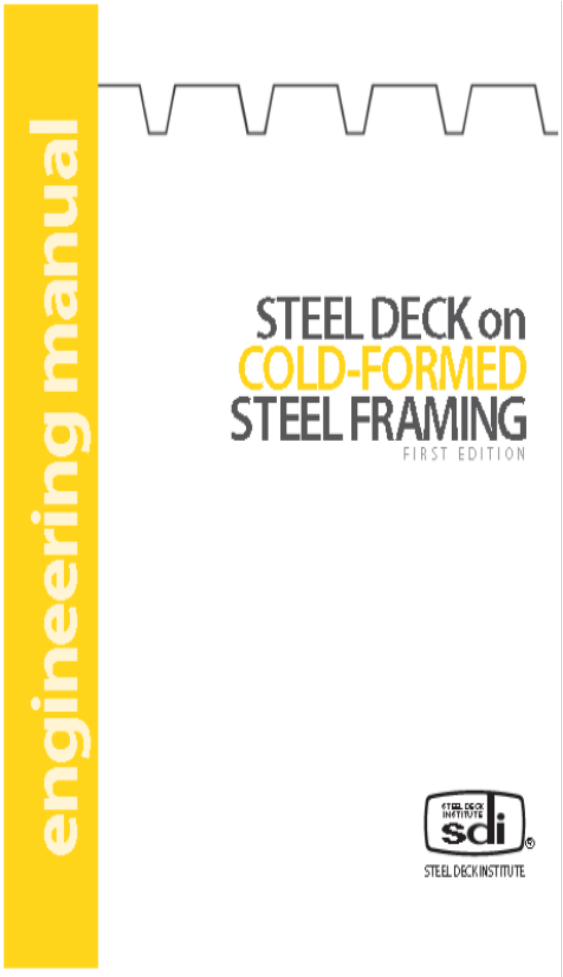
Source: Canam

Can Steel Roof Deck Be Curved?

Curved Diaphragm?

Model as a shell and design diaphragm from rational analysis

Sloped Roof Deck Diaphragms

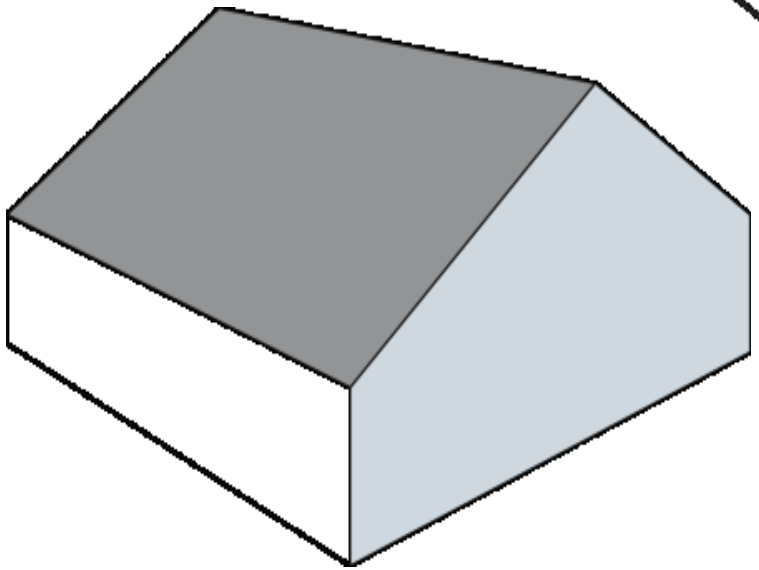


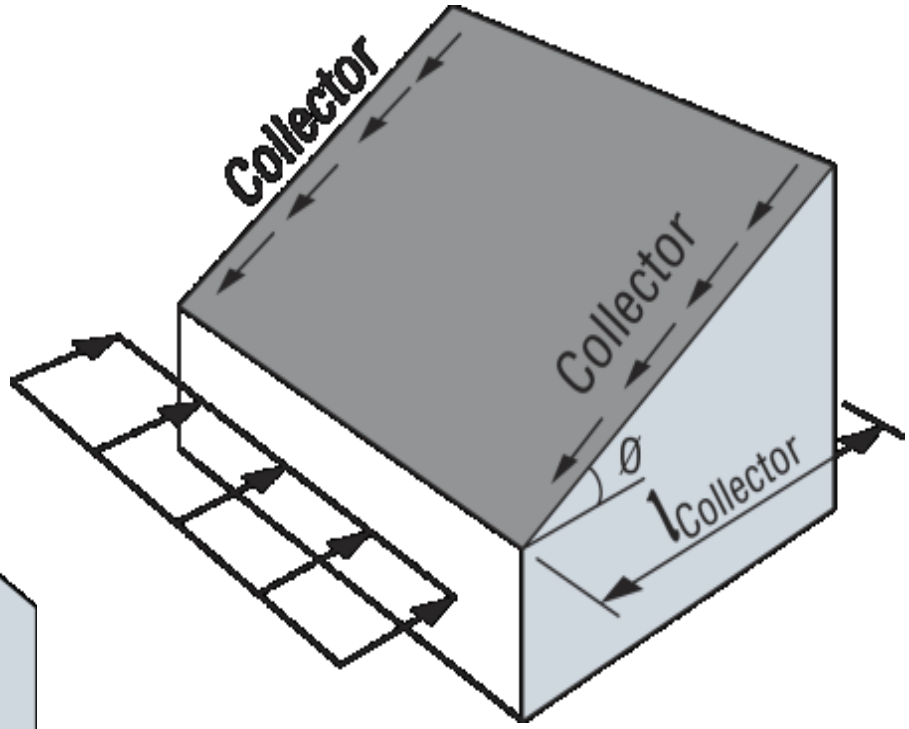
Source for Sloped Diaphragms

- Monoslope
- Gable
- Hipped

- Free PDF download
- $30 hard copy
- www.sdi.org

How Does Roof Slope Affect Diaphragm Forces?





Sloped Roof Deck Diaphragms

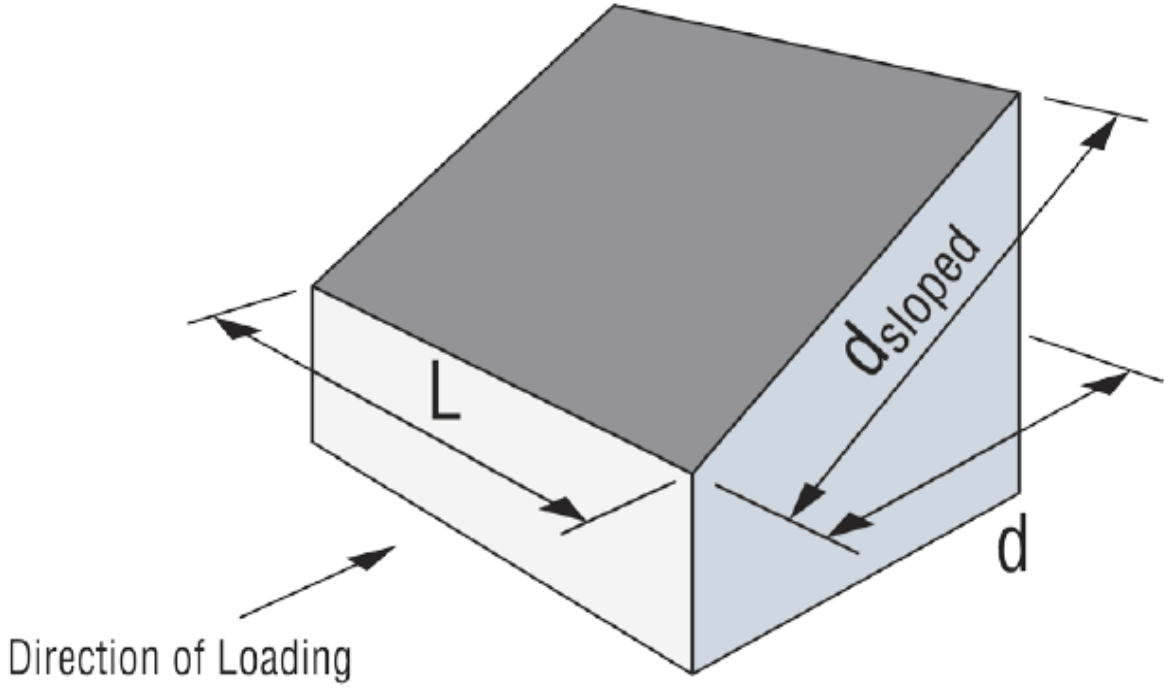
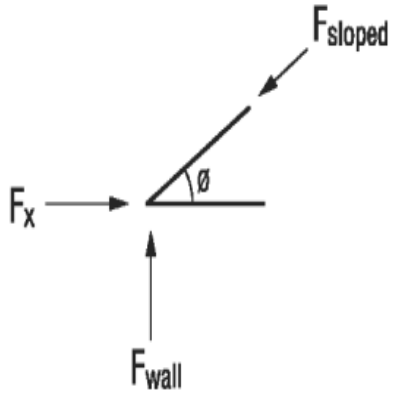


Figure 2.3 - Monoslope Roof

Where:

d	=	Diaphragm depth (parallel to force)
L	=	Diaphragm length(perpendicular to force)

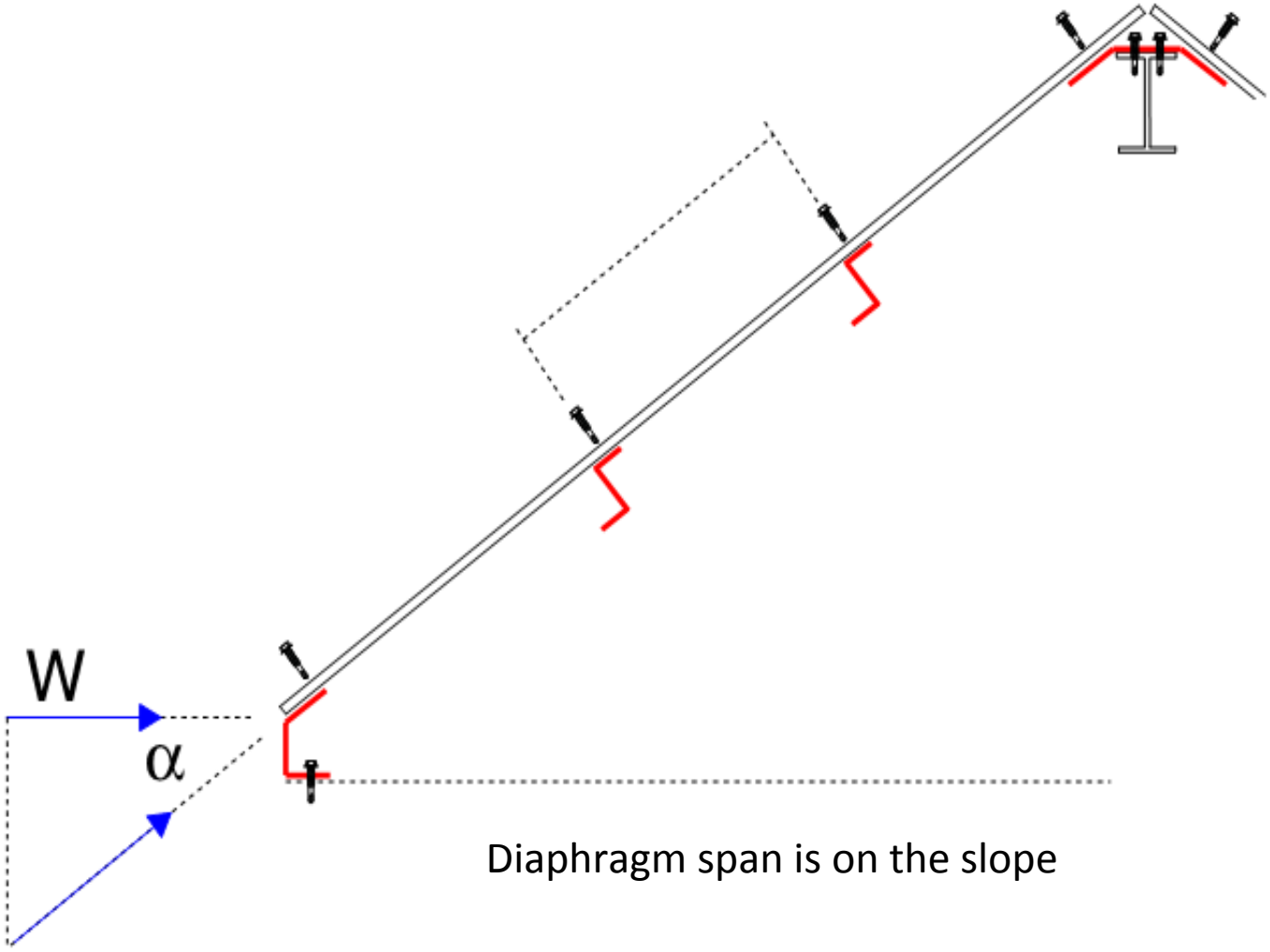
Pitched Roof Deck Diaphragms



Using this geometrical relationship it can be seen that the force in the sloped diaphragm per unit length (pounds per linear foot) is the same as if the roof were flat.

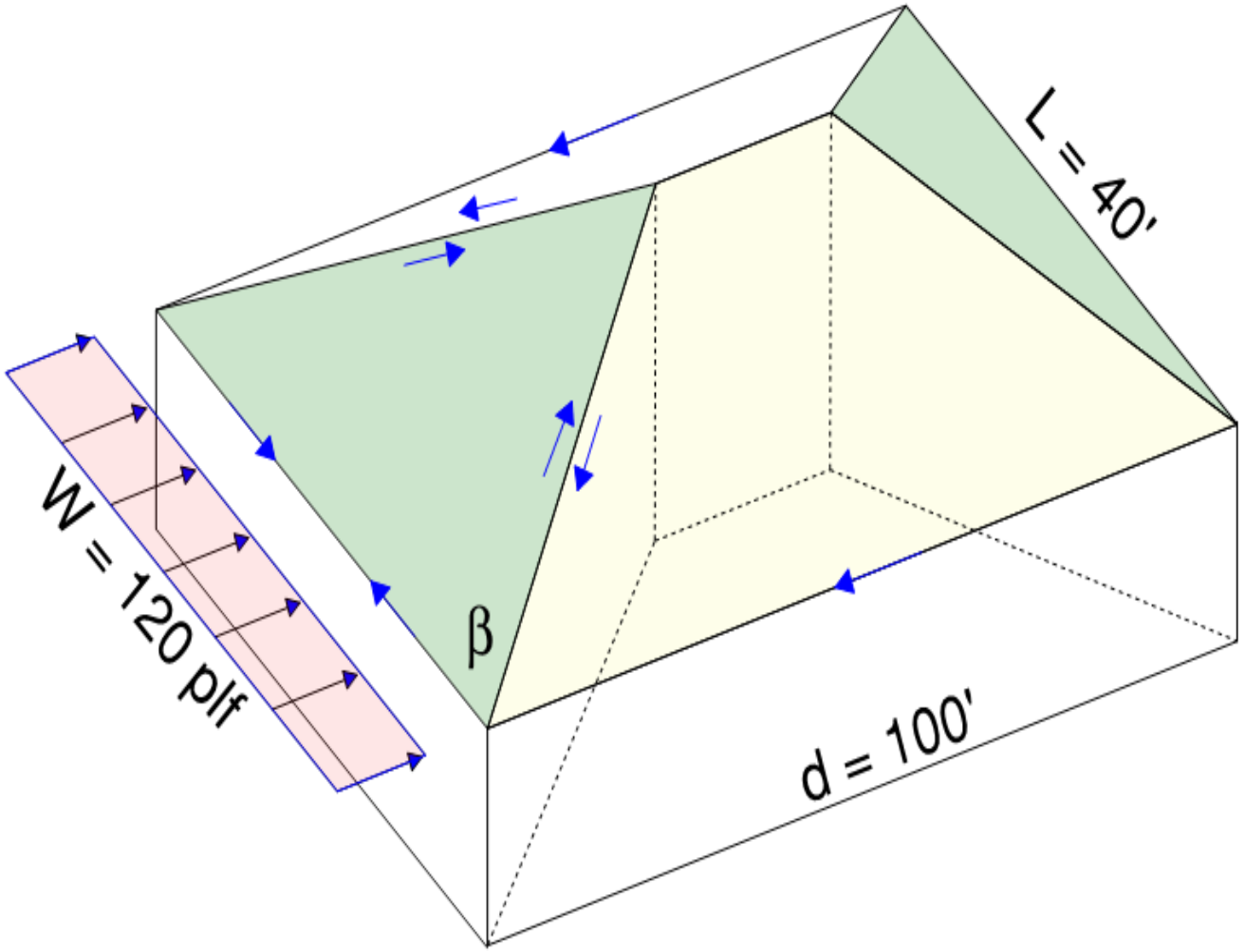
$$v_{diaphragm-sloped} = \frac{F_{sloped}}{d_{sloped}} = \frac{\frac{F_x}{\cos\phi}}{\frac{d}{\cos\phi}} = \frac{F_x(\alpha)}{d(\alpha)} = \frac{F_x}{d} = v_{diaphragm-flat}$$

Pitched Roof Deck Diaphragms



Diaphragm span is on the slope

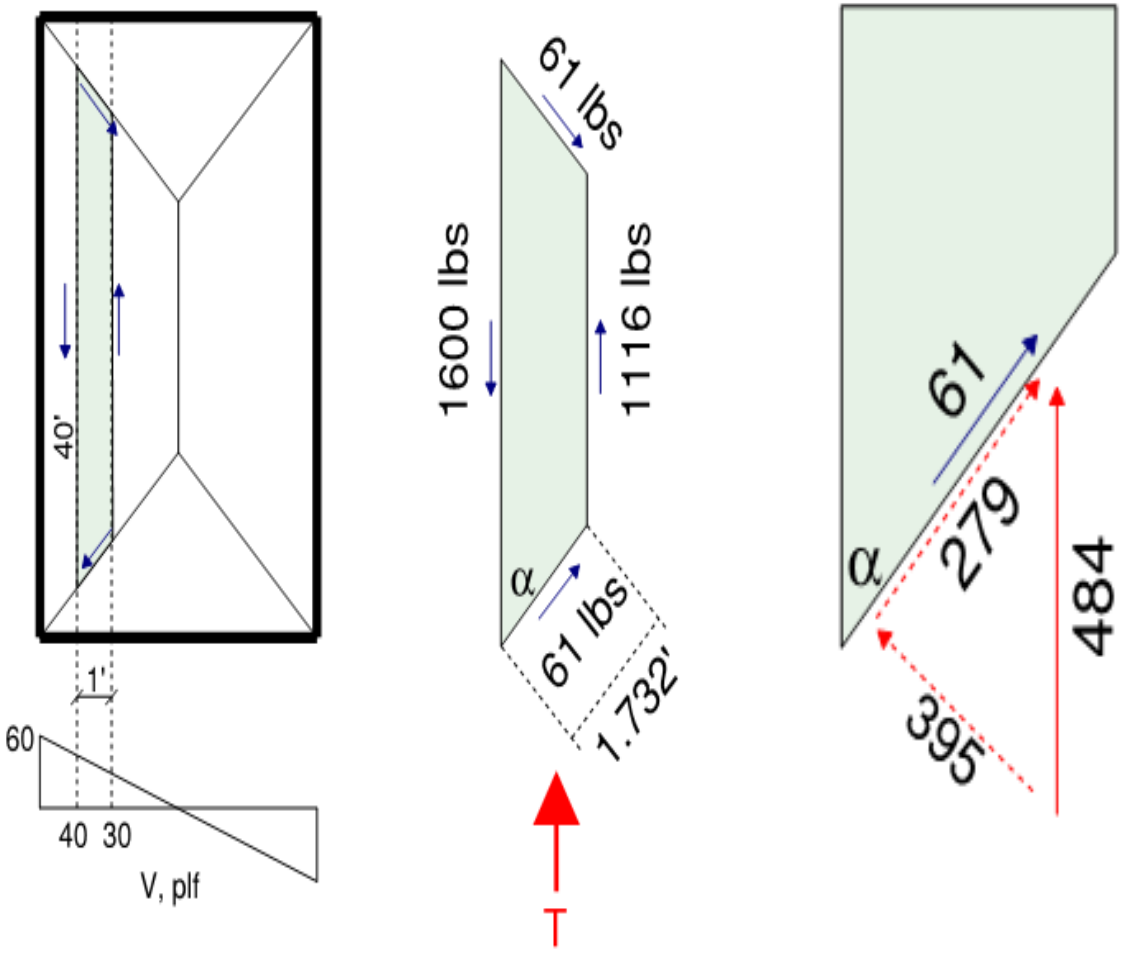
Hip Roof… What Changes?



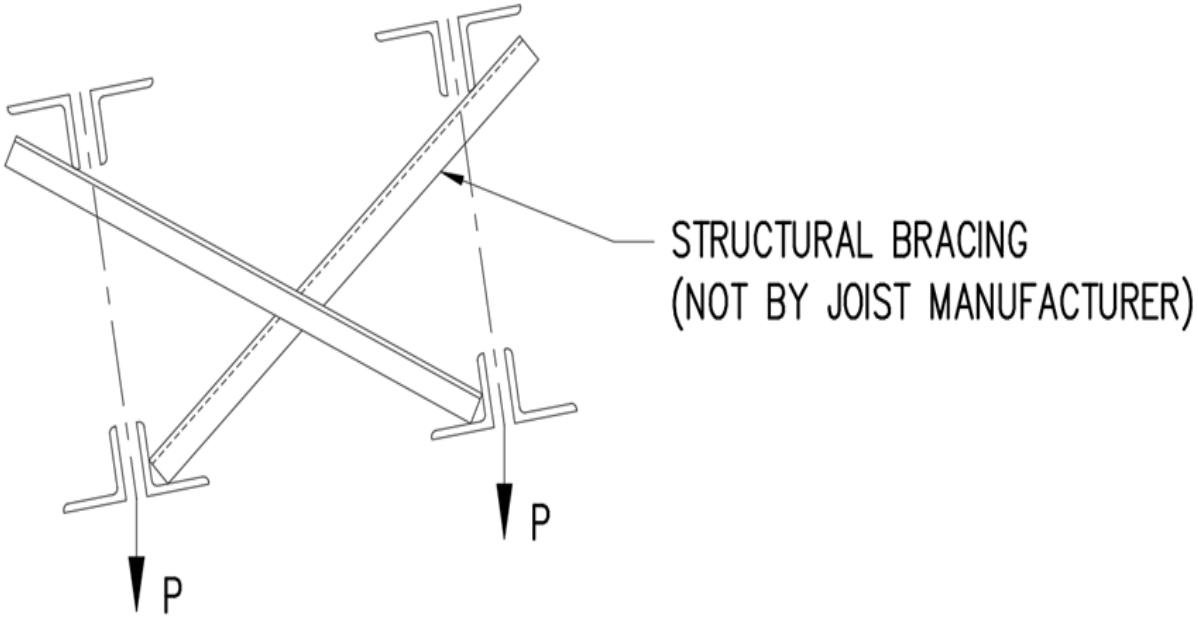
Hip Roof… What Changes?

<u>Rule of Thumb</u>

Double Fasteners On Fold Lines



Axial Force in Sloped Deck?



LATERALLY SLOPED JOISTS

Design bracing to carry downslope forces

Axial Force in Sloped Deck?

Table 11.2 DR Deck

ASD Ω = 1.80 (lbs)													
Deck	3'-0"	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"
DR22	5290	5149	5010	4845	4657	4448	4223	3983	3731	3467	3193	2916	2641
DR20	7325	7169	6973	6740	6475	6184	5829	5476	5102	4722	4339	3958	3580
DR18	11583	11313	10973	10571	10114	9609	9066	8492	7898	7289	6676	5998	5320
DR16	16651	16251	15749	15155	14479	13732	12962	11901	10924	9945	8981	8045	7136
LRFD Φ = 0.85 (lbs)													
Deck	3'-0"	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"
DR22	8048	7878	7666	7414	7125	6806	6460	6093	5709	5305	4885	4461	4040
DR20	11207	10969	10669	10312	9906	9431	8919	8378	7806	7224	6638	6057	5478
DR18	17722	17310	16789	16174	15474	14702	13871	12994	12083	11153	10214	9176	8140
DR16	25476	24864	24096	23187	22153	21010	19679	18209	16713	15216	13742	12309	10919

Table 11.1 WR Deck

ASD Ω = 1.80 (lbs)								
Deck	3'-0"	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"
WR22	5623	5079	4428	3721	3023	2399	1948	1617
WR20	7284	6518	5646	4737	3850	3054	2478	2052
WR18	10371	9279	8041	6748	5479	4303	3400	2754
WR16	13904	12433	10760	8975	7105	5470	4322	3501
LRFD Φ = 0.85 (lbs)								
Deck	3'-0"	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"
WR22	8604	7771	6775	5693	4625	3670	2981	2474
WR20	11145	9973	8638	7247	5891	4673	3791	3140
WR18	15868	14196	12303	10324	8383	6583	5201	4213
WR16	21273	19022	16483	13732	10871	8369	6612	5356

Source: SDI Roof Deck Design Manual

How Planar Does the Bearing Need to Be?

ANSI/SDI RD-2017 Standard for Steel Roof Deck

G. Deck bearing surfaces shall be brought into contact as required by the fastening method.

Commentary: Out of plane support flanges can create knife-edge supports and air gaps between the deck and support. This makes welding more difficult and allows distortion under screw or power actuated fastener washers or heads. Inherent tolerances of the supporting structure should be considered.

How Planar Does the Bearing Need to Be?

ANSI/AWS D1.3 Structural Welding – Sheet Steel

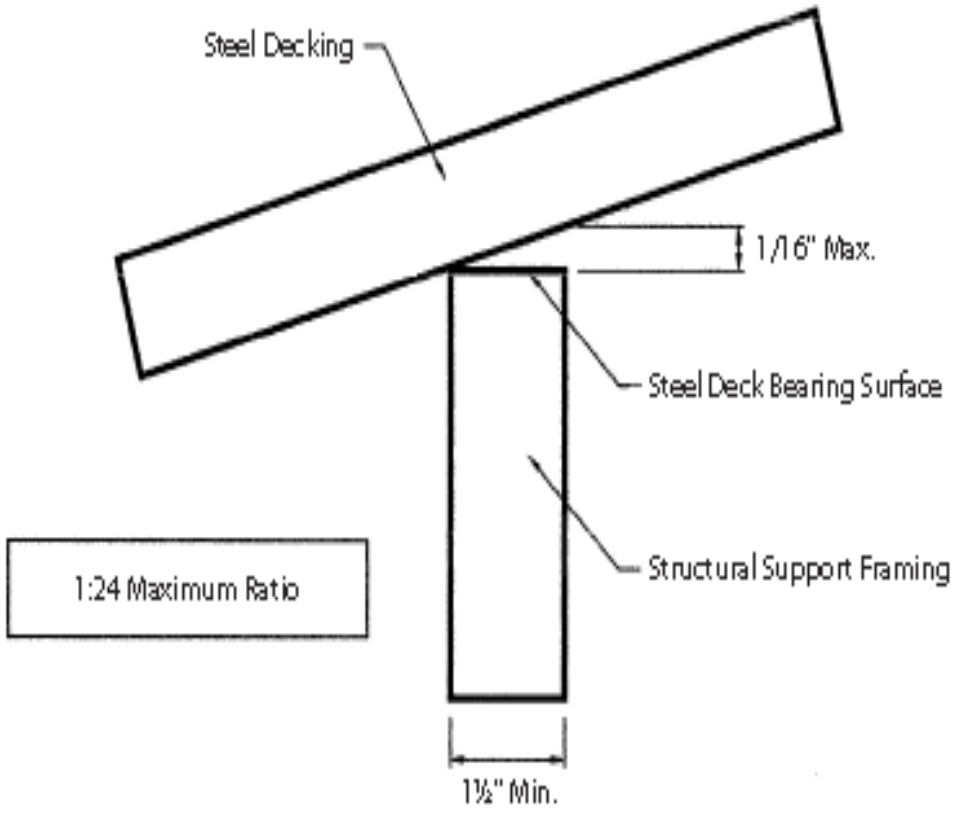
7.3.2 Close Contact. The parts to be joined by welding shall be brought into close contact to facilitate complete fusion between them.

How Planar Does the Bearing Need to Be?

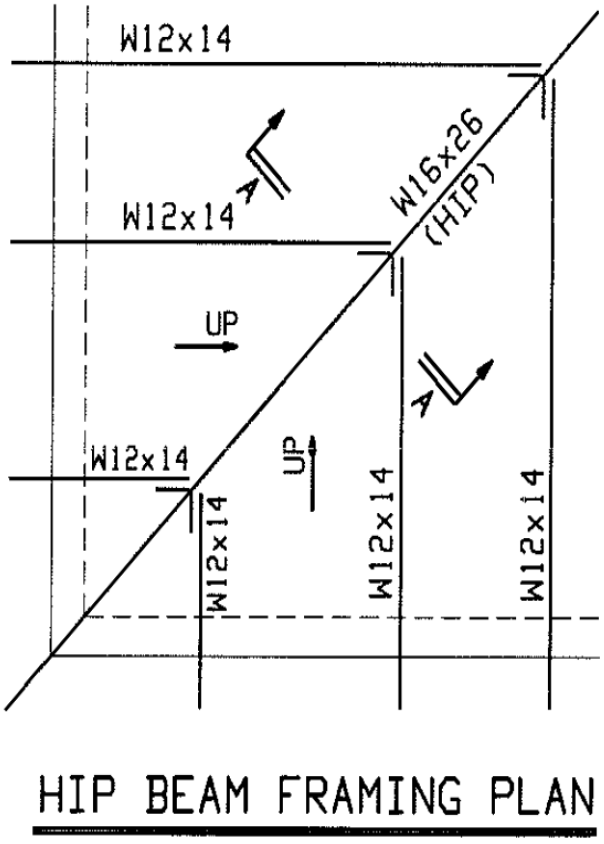
STEEL DECK INSTITUTE

Position Statement

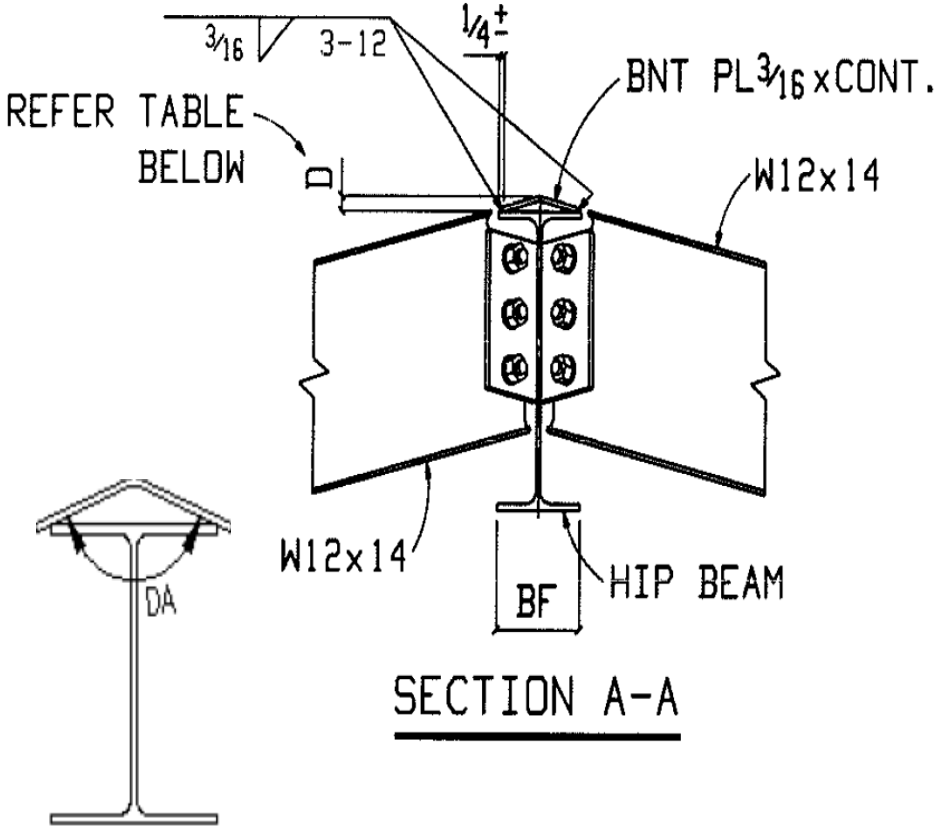
STEEL DECK BEARING SURFACES



How Does Deck Bear in Hips and Valleys?

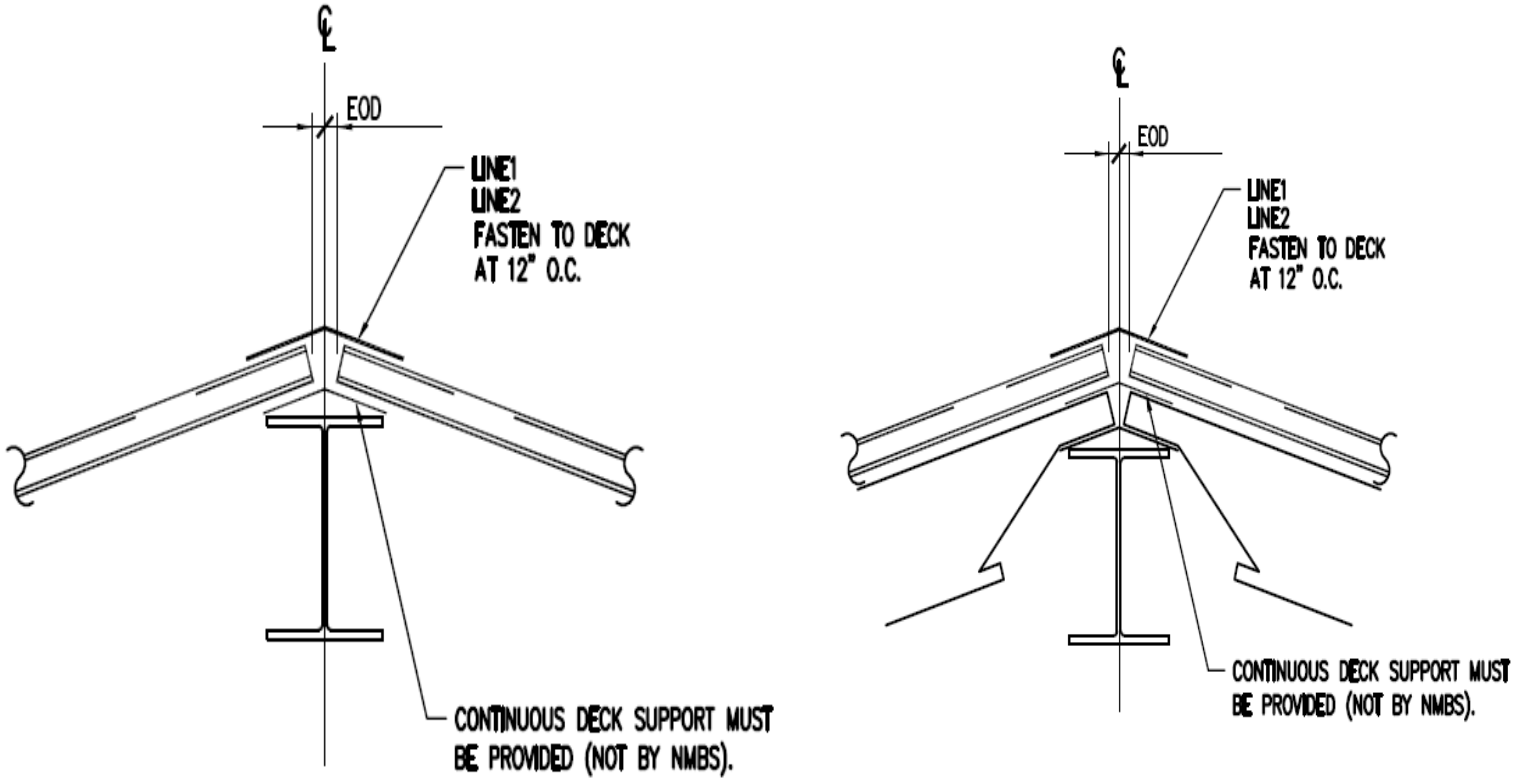


HIP BEAM FRAMING PLAN



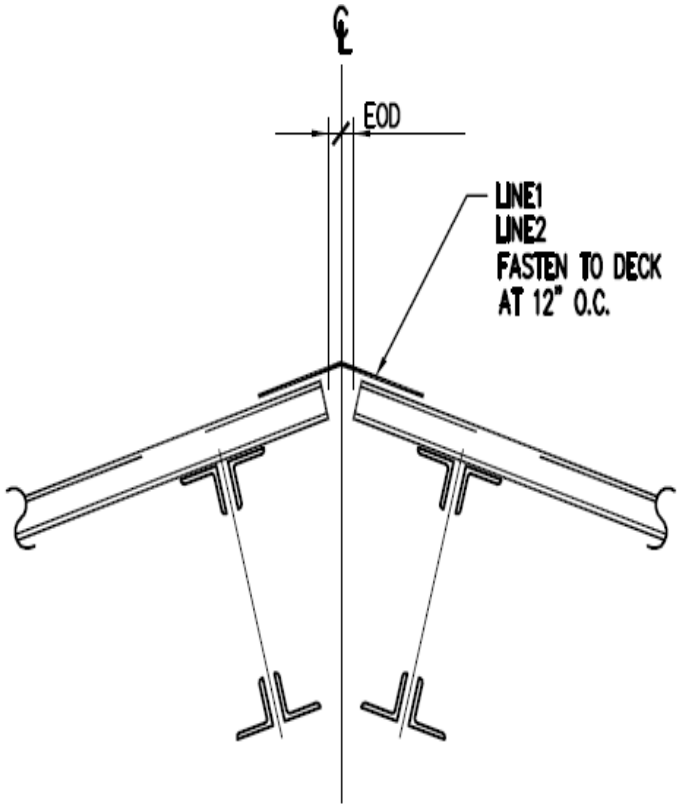
SECTION A-A

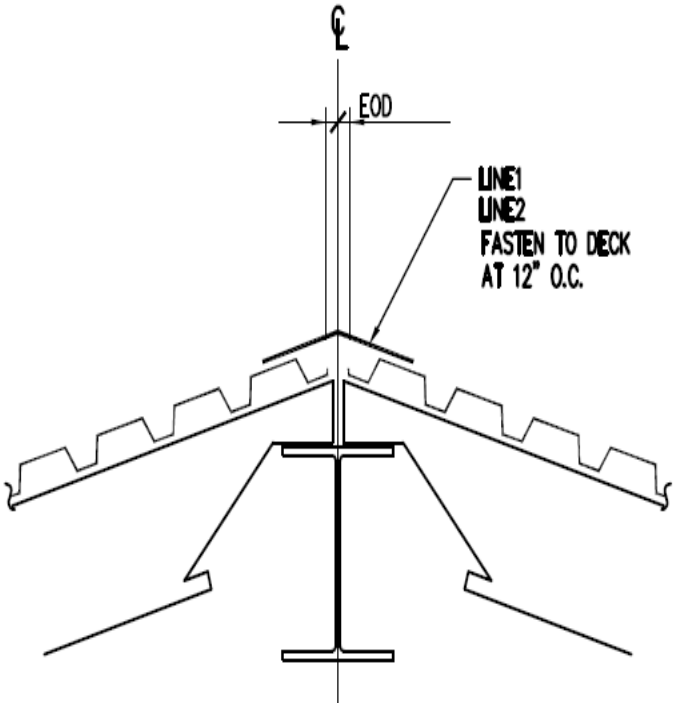
How Does Deck Bear in Hips and Valleys?



Source: New Millennium

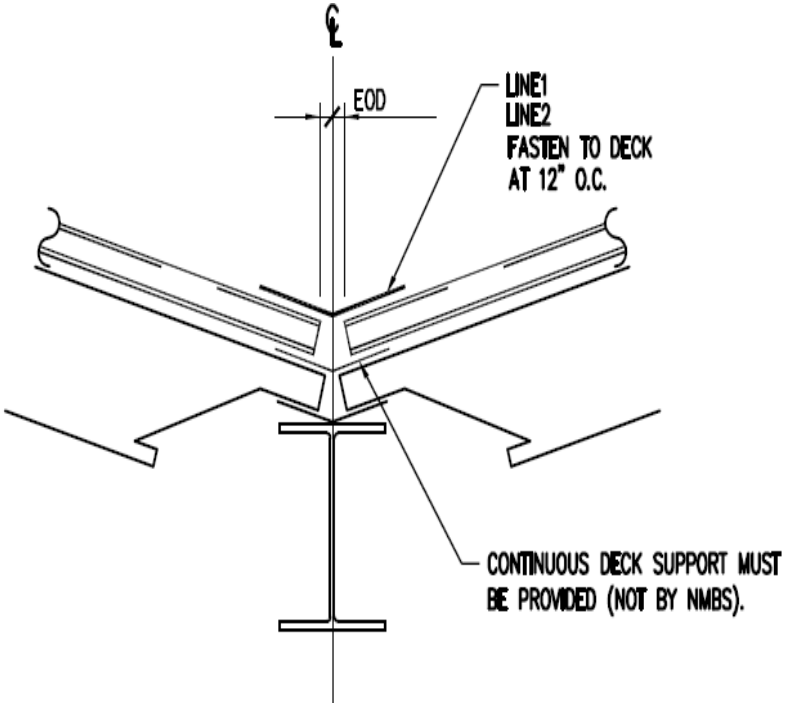
How to Transfer Diaphragm Shear in Hips and Valleys?

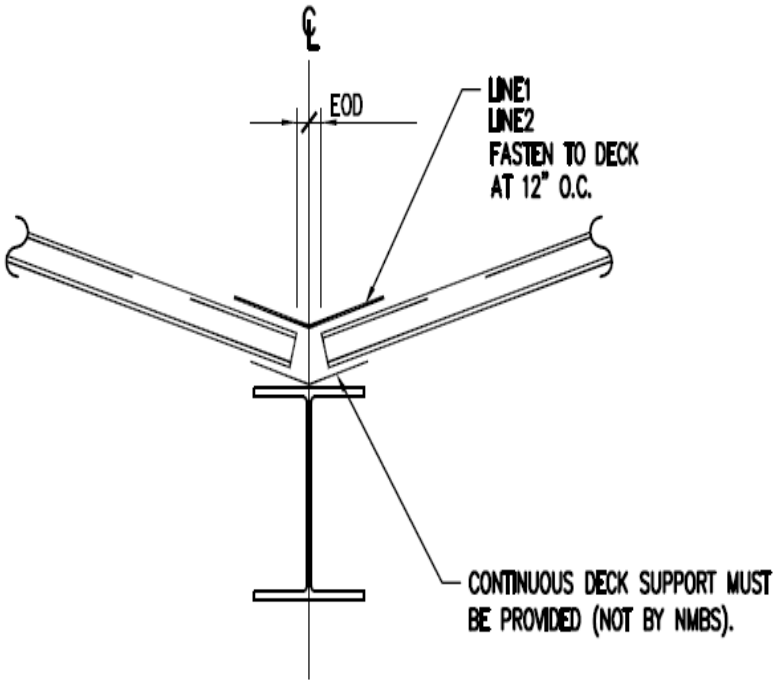




Source: New Millennium

Valleys?





Source: New Millennium

How Should Sloped Roof Deck Be Fastened?

- Arc Spot Welds (aka “Puddle Welds”)
- AWS D1.3 limits to “flat position” (15 deg. = 3.2/12)
- AWS D1.3 does allow for alternate positions if properly documented

STEEL DECK INSTITUTE

Position Statement

ARC SPOT WELDING OF STEEL DECK ON SLOPED ROOFS

This position statement has been prepared by the Steel Deck Institute in response to inquiries regarding the arc spot welding of steel deck on sloped roofs, and reflects the opinion of the Institute. Arc spot welds continue to be used successfully for steel deck attachment on sloped roofs. This position statement addresses the welding of deck on sloped surfaces, and does not address the orientation of the deck bearing surface, which must be parallel to the bottom plane of the deck. Parallel bearing surfaces are addressed in Section 3.1.1 of ANSI/RD-2010, *Standard for Steel Roof Deck*.

The controlling standard for sheet steel welding is AWS D1.3:2008, *Structural Welding Code – Sheet Steel*, which states the following regarding arc spot welds in Clause 1.5.4:

> *These welds are restricted to the welding of sheet steel to supporting structural member in a flat position.*

AWS A3.0:2010, *Standard Welding Terms and Definitions defines* the flat position as being plus or minus 15 degrees from level. Fifteen degrees equates to a roof slope of 3.2/12.

AWS D1.3, Clause 1.1.2 does permit variance from flat position limit by stating:

> *The fundamental premise of the code is to provide general stipulations applicable to any situation. Acceptance criteria for production welds different from those specified in the code shall be permitted for a particular application, provided they are suitably documented by the proposer and approved by the Engineer. These alternate acceptance criteria shall be based upon evaluation of suitability for service using past experience, experimental evidence, or engineering analysis considering material type, service load effects, and environmental factors.*

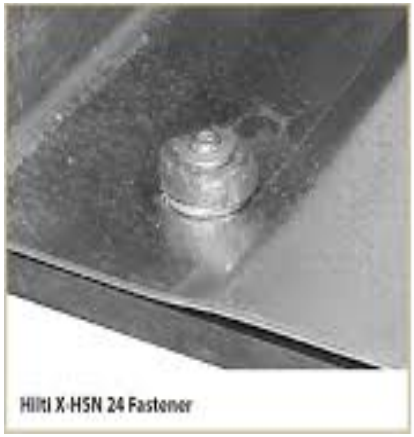
Based on this, an arc spot weld in a position other than flat would be permitted if suitably documented by the proposer and approved by the Engineer. The documentation and acceptance criteria required by Clause 1.1.2 could include Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) prepared for welds performed at the intended roof slope. Information regarding WPS and PQR are found in Clause 4. It should be additionally noted that arc spot welds in any position are not considered prequalified in Clause 3, and would require WPS and PQR's even in the flat position.

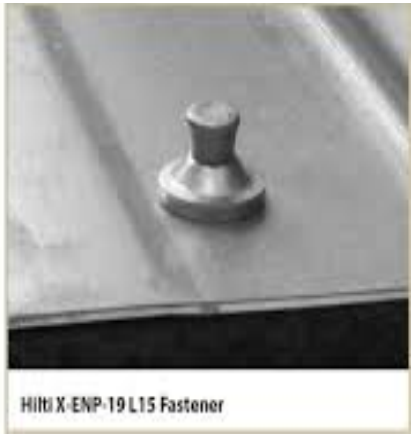
In the event that the Engineer does not approve welding, steel decks may also be fastened to sloped roofs successfully with mechanical fasteners such as screws or power-actuated fasteners, which have no such limitations.

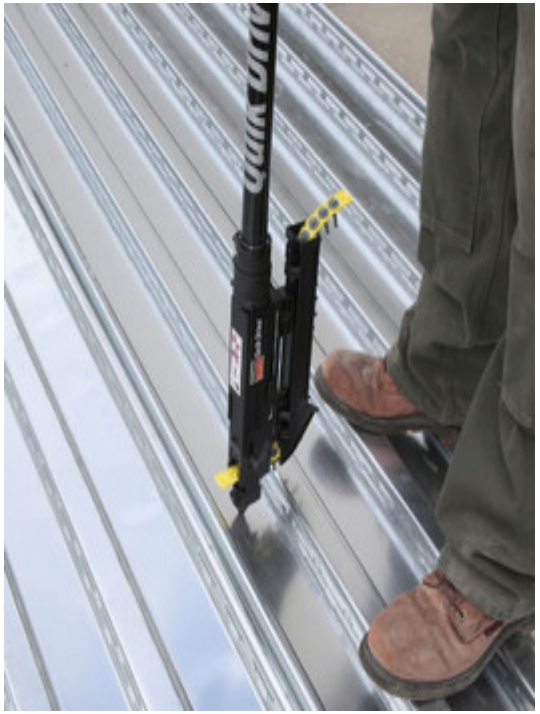
Adopted by SDI - August 2012

How Should Sloped Roof Deck Be Fastened?

- Screws and Power Actuated Fasteners
- No Limits on Roof Slope


Hilti X-HSN 24 Fastener


Hilti X-ENP-19 L15 Fastener



Source: Hilti and Simpson Strong-Tie

Interaction of Wind Uplift and Diaphragm Shear

- Interaction of wind uplift and diaphragm shear
- What wind forces should be used?
- Let’s look at fastener behavior in shear and tension

Interaction of Wind Uplift and Diaphragm Shear

1.5WR22		
Design thickness = 0.0295 in.		
$F_{y\text{-deck}}$=	33	ksi
$F_{u\text{-deck}}$=	45	ksi
Framing designation = 43 mils		
Framing thickness = 0.0451 in.		
$F_{y\text{-framing}}$=	33	ksi
$F_{u\text{-framing}}$=	45	ksi
Support fastening: #12 screws		
Side-lap fastening: #10 screws		

Diaphragm Table with Zero Uplift

	S310-13		S310-16	
Loading	ϕ_{df}	Ω_{df}	ϕ_{df}	Ω_{df}
Seismic	0.65	2.50	0.70	2.30
Wind	0.70	2.35	0.80	2.00
Other	0.65	2.50	0.70	2.30

Fastener Layout	Side-lap Conn/Span	Nominal Shear Strength, S_{nf}, plf[1,2] Span 24"	32"	48"	64"	72"	96"	K_1 1/ft
	0	1425	1120	765				0.274
36/14	1	1565	1245	865	640	565		0.236
$\alpha_1=\alpha_2$= 4.000	2	1690	1360	960	720	635	465	0.207
$\alpha_p^2=\alpha_e^2$= 1.556	3	1810	1470	1045	795	705	520	0.185
N= 4.000	4	1915	1575	1135	875	775	570	0.166
A= 2	5	2010	1670	1215	945	845	620	0.151
	6	2100	1760	1295	1010	910	675	0.139

Interaction of Wind Uplift and Diaphragm Shear

$$\%\,Shear + \%\,Tension \leq 1.0$$

$$\left(\frac{P_{nft}}{P_{nf}}\right)^{1.5} + \left(\frac{\Omega_t T}{P_{nt}}\right)^{1.5} = 1.0$$

$$\left(\frac{P_{nft}}{P_{nf}}\right)^{1.5} + \left(\frac{\overline{T}}{\Phi_t P_{nt}}\right)^{1.5} = 1.0$$

$$\frac{P_{nft}}{\Omega_d P_{nf}} + \frac{T}{T_n} = \frac{1.15}{\Omega}$$

$$\frac{\Phi_d P_{nft}}{P_{nf}} + \frac{T}{T_n} = 1.15\Phi$$

$$\frac{P_{nft}}{\Omega_d P_{nf}} + \frac{0.71T}{T_n} = \frac{1.1}{\Omega}$$

$$\frac{\Phi_d P_{nft}}{P_{nf}} + \frac{0.71T}{T_n} = 1.1\Phi$$

Source: AISI S100 and AISI S310

What Wind Pressure Should I Use?

Roof deck performs 2 functions:

- As Roof SHEATHING, carrying gravity and wind uplift (or downward) loads
- As a DIAPHRAGM, transferring lateral loads into the Lateral Force Resisting System

Interaction of Wind Uplift and Diaphragm Shear

C26.2 DEFINITIONS: COMPONENTS AND CLADDING:

… Cladding receives wind loads directly. Examples of components include fasteners, … roof decking … Components can be part of the MWFRS when they act as … roof diaphragms, but they may also be loaded as individual components.

Interaction of Wind Uplift and Diaphragm Shear

C26.2 DEFINITIONS: MAIN WIND-FORCE RESISTING SYSTEM (MWFRS)

Can consist of … an assemblage of structural elements that work together to transfer wind loads acting on the entire structure to the ground. Structural elements such as … roof diaphragms are part of the Main Wind-Force Resisting System (MWFRS) …

Interaction of Wind Uplift and Diaphragm Shear

ROOF DECK AS SHEATHING

Roof Dead, Roof Live, and C&C Wind Pressures (uplift or downward)

ROOF DECK AS DIAPHRAGM

Roof Dead, Roof Live, and MWFRS Wind Pressures (uplift or downward) and MWFRS Wind Diaphragm Shear

I Want a 5 Minute Solution for Diaphragms. Can S.D.I. Help?

SDI Diaphragm Interaction Calculator

Deck Profile	1.5 x 6	WR	Support Fastener	#12 screw	
Deck Gage	22		Support Fastener Pattern	36/7	
Deck F_y, F_u	33, 45	ksi	Sidelap Fastener	#10 screw	
			Substrate thickness, t_2	CF33 mil (20 gage)	
(-) Uplift, ASCE 7-10	50	psf	Substrate F_y, F_u	33, 45	ksi
			Number of Spans	3	
			AISI S-310	2016	

- CF, DDM04 and S310 Diaphragm Tool
- Nominal, ASD and LFRD outputs
- Tension – Shear Interaction
- Calculations Page

Polling Question #2

The interaction of wind uplift and diaphragm shear is calculated:

A. Using Component and Cladding Pressures

B. Using Main Wind Force Resisting System Pressures

C. Does not need to be considered

Polling Question Answers

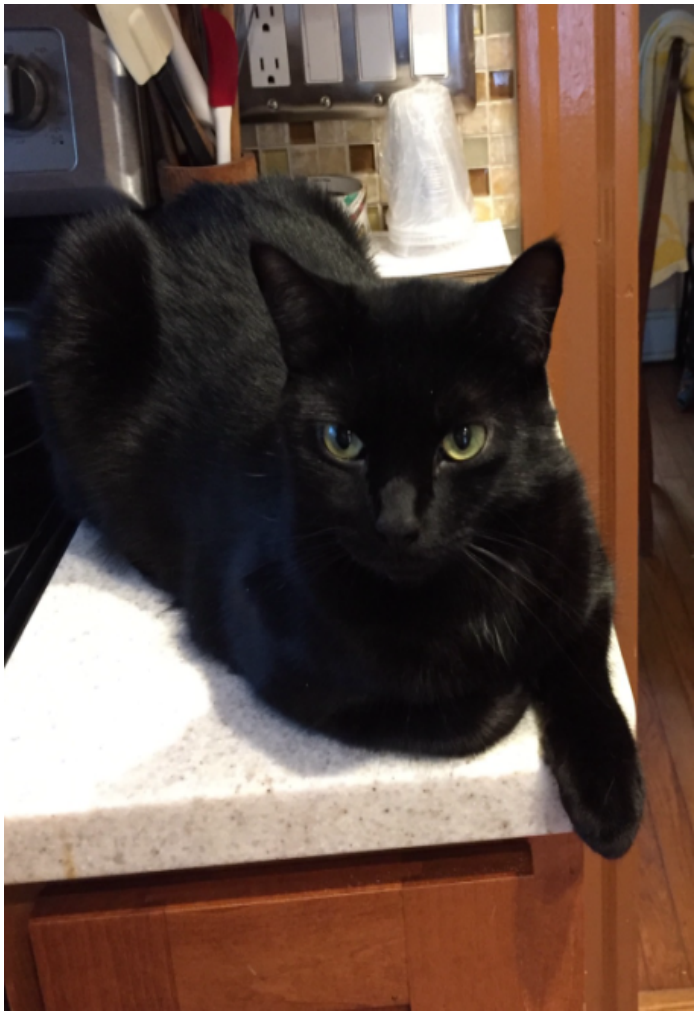
In order to eliminate the horizontal thrust force from a scissor joist, you should:

B. Use a slip connection at one end of the joist

The interaction of wind uplift and diaphragm shear is calculated:

B. Using Main Wind Force Resisting System Pressures

My Servants Will Now Answer Your Questions



THANK YOU

Presented by:

Ben Pitchford, P.E.
Thomas Sputo, Ph.D, P.E., S.E.