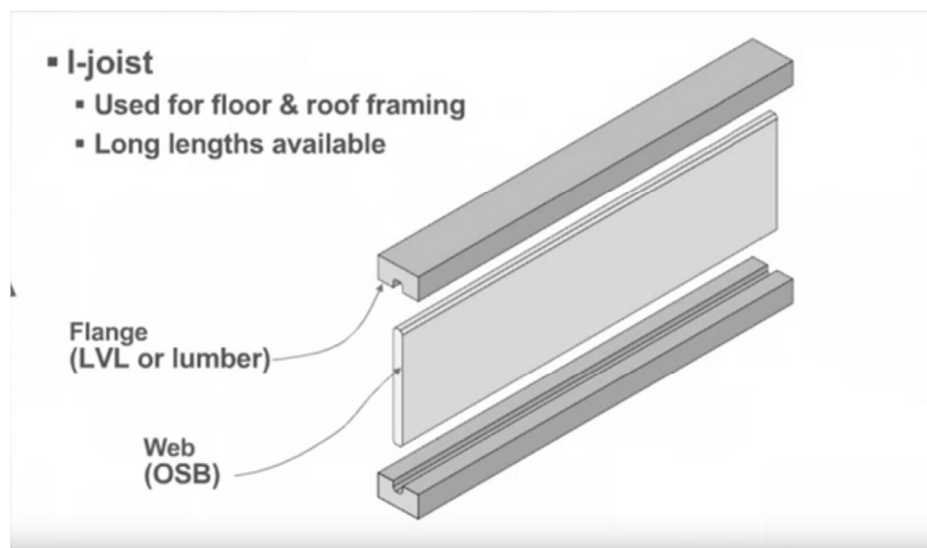


## Engineered Wood Products: I-Joists

- Properties
- NDS criteria
- Literature & Design Aids
- Applications




## I-Joists





# I-Joists

- I-Joist vs. Lumber
  - Both at 16" o.c.
    - 36% less wood fiber
  - I-Joist at 19.2" o.c. & Lumber at 16" o.c.
    - 46% less wood fiber



I-Joist





Lumber

# APA – E30



## Engineered Wood

CONSTRUCTION GUIDE



### A GUIDE TO ENGINEERED WOOD PRODUCTS

The evolution of engineered wood products has greatly expanded building options and methods in all forms of residential and commercial construction. The product section of this APA guide provides product information and specification recommendations for several of the most common engineered wood products—plywood, oriented strand board, glulam, structural composite lumber (SCL) and I-joists. Other engineered wood products that are often used in the construction systems described in this guide include cross-laminated timber (CLT) and Rim Board®.

“Engineered wood” describes wood products that are engineered for structural applications. Plywood has been used since the 1940s and is considered by many to be the original engineered wood product. Engineered wood products are made by combining wood strands, veneers, lumber or other wood fiber with moisture-resistant adhesives to form a larger composite structural unit. They are designed and manufactured to maximize the natural strength and stiffness characteristics of wood by optimally orienting the wood veneers, strands or laminations and by combining wood with durable structural adhesives.

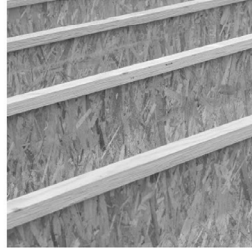


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# APA – Z725



## Performance Rated I-Joists DESIGN AND CONSTRUCTION GUIDE



**Performance Rated I-Joists**

We have field representatives in many major U.S. sites and in Canada who can help answer questions involving APA engineered products. For additional assistance in specifying engineered wood products, contact us:

**APA HEADQUARTERS**  
7011 So. Ave. S., Tacoma, Washington 98449  
(253) 886-8000 • Fax: (253) 888-7548

**PRODUCT SUPPORT HELP DESK**  
(253) 620-7400 • [help@apawood.org](mailto:help@apawood.org)

**DISCLAIMER**

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REPRESENTING THE ENGINEERED WOOD INDUSTRY

# APA – manufacture of I Joists



# Manufactures Literature

Weyerhaeuser.com  
TJ-4000



#TJ-4000 | SPECIFIER'S GUIDE

## TJI® 110, TJI® 210, TJI® 230, TJI® 360, TJI® 560 AND TJI® 560D JOISTS

Featuring Trus Joist® TJI® Joists for  
Floor and Roof Applications

- Uniform and Predictable
- Lightweight for Fast Installation
- Resource Efficient
- Resists Bowing, Twisting, and Shrinking
- Significantly Reduces Callbacks
- Available in Long Lengths
- Limited Product Warranty



Now featuring  
18" - 24" TJI® joists

University of Michigan, TCAUP

Wood

Slide 7 of 28

## NDS – Chap. 7

- General
- Adjustment Factors

### 7.1.2 Definition

The term “prefabricated wood I-joist” refers to a structural member manufactured using sawn or structural composite lumber flanges and wood structural panel webs bonded together with exterior exposure adhesives, forming an “I” cross-sectional shape.



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NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION 47

## PREFABRICATED WOOD I-JOISTS

7.1	General	48
7.2	Reference Design Values	48
7.3	Adjustment of Reference Design Values	48
7.4	Special Design Considerations	50

Table 7.3.1 Applicability of Adjustment Factors for Prefabricated Wood I-Joists ..... 49

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Wood

Slide 8 of 28

**7.2 Reference Design Values**

Reference design values for prefabricated wood I-joists shall be obtained from the prefabricated wood I-joist manufacturer's literature or code evaluation reports.

**7.3 Adjustment of Reference Design Values**

**7.3.2 Load Duration Factor,  $C_D$  (ASD Only)**

All reference design values except stiffness, EI,  $(EI)_{min}$ , and K, shall be multiplied by load duration factors,  $C_D$ , as specified in 2.3.2.

**7.3.3 Wet Service Factor,  $C_M$**

Reference design values for prefabricated wood I-joists are applicable to dry service conditions as specified in 7.1.4 where  $C_M = 1.0$ . When the service conditions differ from the specified conditions, adjustments for high moisture shall be in accordance with information provided by the prefabricated wood I-joist manufacturer.

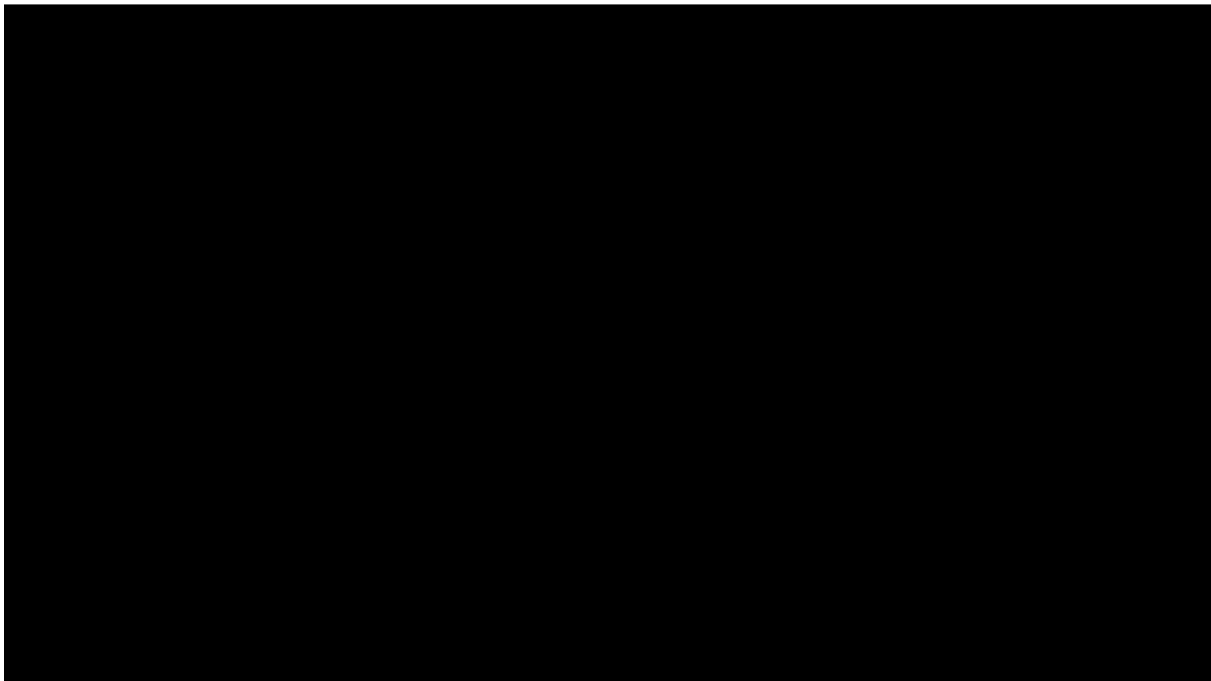
**7.3.4 Temperature Factor,  $C_t$**

When structural members will experience sustained exposure to elevated temperatures up to 150°F (see Appendix C), reference design values shall be multiplied by the temperature factors,  $C_t$ , specified in 2.3.3. For  $M_r$ ,  $V_r$ ,  $R_r$ , EI,  $(EI)_{min}$ , and K use  $C_t$  for  $F_b$ ,  $F_v$ ,  $E$ ,  $E_{min}$ , and  $F_v$ , respectively.

**Table 7.3.1 Applicability of Adjustment Factors for Prefabricated Wood I-Joists**

		ASD only	ASD and LRFD					LRFD only		
		Load Duration Factor	Wet Service Factor	Temperature Factor	Beam Stability Factor	Repetitive Member Factor	Format Conversion Factor	Resistance Factor	Time Effect Factor	
							$K_F$	$\phi$		
$M_r' = M_r$	x	$C_D$	$C_M$	$C_t$	$C_L$	$C_r$	$K_F$	0.85	$\lambda$	
$V_r' = V_r$	x	$C_D$	$C_M$	$C_t$	-	-	$K_F$	0.75	$\lambda$	
$R_r' = R_r$	x	$C_D$	$C_M$	$C_t$	-	-	$K_F$	0.75	$\lambda$	
$EI' = EI$	x	-	$C_M$	$C_t$	-	-	-	-	-	
$(EI)_{min}' = (EI)_{min}$	x	-	$C_M$	$C_t$	-	-	$K_F$	0.85	-	
$K' = K$	x	-	$C_M$	$C_t$	-	-	-	-	-	

I-Joists – APA - construction methods

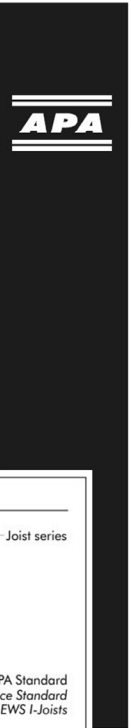


# I-Joists – APA - construction methods – glued & nailed



## APA Performance Rated I-Joists

### Z725



Performance  
Rated I-Joists  
DESIGN AND CONSTRUCTION GUIDE



**SAMPLE TRADEMARK** – Position of trademark on I-Joist may vary by manufacturer

Net I-joist depth

Joist series

Identifies I-joists as being manufactured in conformance with APA Standard PRI-400, Performance Standard for APA EWS I-Joists

Conforms with APA Standard Performance Standard for APA EWS I-Joists

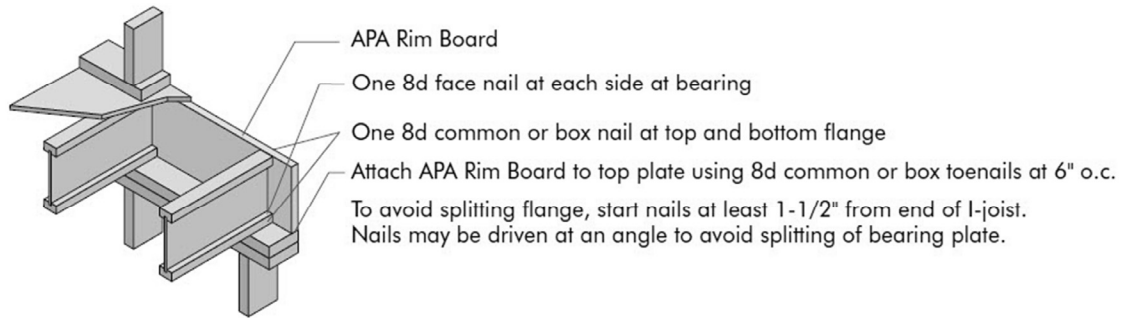
Plant number

# APA – Z725 I-Joist – rim board

1b

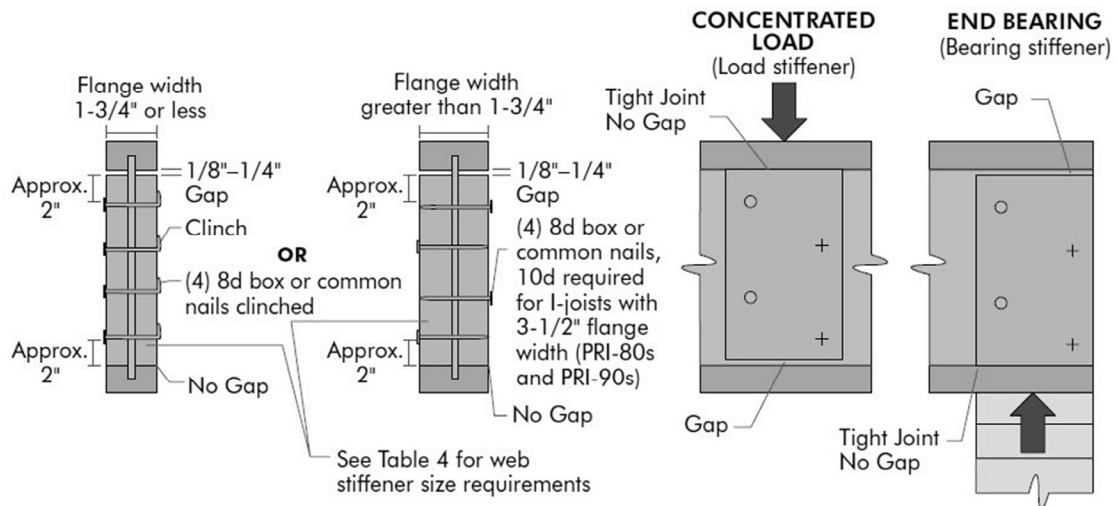
Blocking Panel or Rim Joist	Uniform Vertical Load Transfer Capacity <sup>a</sup> (plf)
1-1/8" APA Rim Board Plus, B2 or better <sup>b</sup>	4850
1-1/8" APA Rim Board, C1 or better <sup>b</sup>	4400
1" APA Rim Board, C2 or better <sup>b</sup>	3300

- a. The uniform vertical load capacity is limited to a Rim Board depth of 16 inches or less and shall not be increased for any load duration shorter than the normal (10-yr) load duration. It shall not be used in the design of a bending member, such as joist, header, or rafter. For concentrated vertical load transfer capacity, see 1d.
- b. See ANSI/APA PRR 410, *Standard for Performance-Rated Engineered Wood Rim Boards*, Form PRR-410.



# APA – Z725 I-Joist – web stiffeners

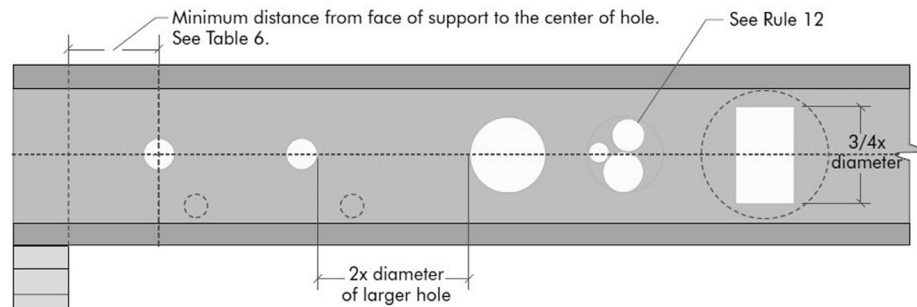
## WEB STIFFENER INSTALLATION DETAILS



# I-Joists

## PRI JOIST TYPICAL HOLES

hole placement



Knockouts are prescored holes often provided by I-joist manufacturers for the contractor's convenience to install electrical or small plumbing lines. They are typically 1-3/8 to 1-3/4 inches in diameter, and are spaced 12 to 24 inches on center along the length of the I-joist. Where possible, it is preferable to use knockouts instead of field-cutting holes.



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# I-Joists

## Cutting the Hole

- Never drill, cut or notch the flange, or over-cut the web.
- Holes in webs should be cut with a sharp saw.
- For rectangular holes, avoid over-cutting the corners, as this can cause unnecessary stress concentrations. Slightly rounding the corners is recommended. Starting the rectangular hole by drilling a 1-inch-diameter hole in each of the four corners and then making the cuts between the holes is another good method to minimize damage to the I-joist.



University of Michigan, TCAUP

Wood



# Weyerhaeuser – Trus Joist - TJI

## ALLOWABLE HOLES

9½" - 16" JOISTS

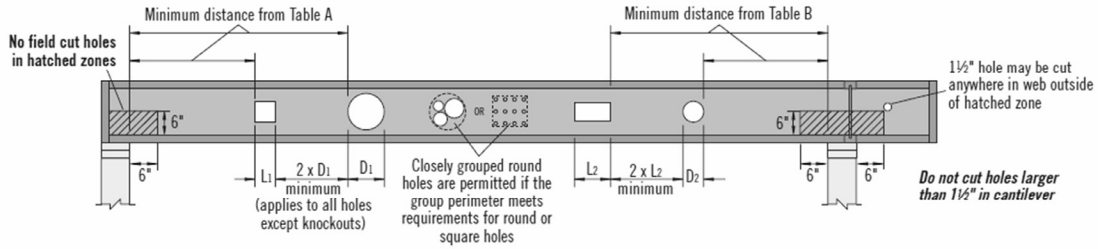


Table A, End Support: Minimum distance from edge of hole to inside face of nearest end support

Depth	TJI®	● Round Hole Size									■ Square or Rectangular Hole Size								
		2"	3"	4"	5"	6½"	7"	8½"	11"	13"	2"	3"	4"	5"	6½"	7"	8½"	11"	13"
9½"	110	1'-0"	1'-6"	2'-0"	3'-0"	5'-0"					1'-0"	1'-6"	2'-6"	3'-6"	4'-6"				
	210	1'-0"	1'-6"	2'-6"	3'-0"	5'-6"					1'-0"	2'-0"	2'-6"	4'-0"	5'-0"				
	230	1'-6"	2'-0"	2'-6"	3'-6"	5'-6"					1'-0"	2'-0"	3'-0"	4'-6"	5'-0"				
11½"	110	1'-0"	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	5'-6"			1'-0"	1'-6"	2'-0"	2'-6"	4'-6"	5'-0"	6'-0"		
	210	1'-0"	1'-6"	2'-0"	2'-0"	3'-0"	3'-6"	6'-0"			1'-0"	1'-6"	2'-6"	3'-0"	5'-0"	5'-6"	6'-6"		
	230	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	6'-6"			1'-0"	2'-0"	2'-6"	3'-6"	5'-6"	5'-6"	7'-0"		
	360	1'-6"	2'-0"	3'-0"	3'-6"	4'-6"	5'-0"	7'-0"			1'-6"	2'-6"	3'-6"	4'-6"	6'-6"	6'-6"	7'-6"		
	560	1'-6"	2'-6"	3'-0"	4'-0"	5'-6"	6'-0"	8'-0"			2'-6"	3'-6"	4'-6"	5'-6"	7'-0"	7'-6"	8'-0"		
14"	110	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	2'-0"	3'-0"	5'-6"		1'-0"	1'-0"	1'-6"	2'-0"	3'-6"	4'-0"	6'-0"	8'-0"	
	210	1'-0"	1'-0"	1'-0"	1'-6"	2'-0"	2'-6"	3'-6"	6'-0"		1'-0"	1'-0"	2'-0"	2'-6"	4'-0"	4'-6"	6'-6"	8'-6"	
	230	1'-0"	1'-0"	1'-0"	1'-6"	2'-6"	2'-6"	4'-0"	7'-0"		1'-0"	1'-0"	2'-0"	3'-0"	4'-0"	5'-0"	7'-0"	9'-0"	
	360	1'-0"	1'-0"	1'-6"	2'-6"	3'-6"	4'-0"	5'-6"	8'-0"		1'-0"	1'-6"	2'-6"	4'-0"	6'-0"	6'-6"	8'-0"	9'-6"	
	560	1'-0"	1'-0"	2'-0"	3'-0"	4'-6"	5'-0"	6'-6"	9'-0"		1'-6"	3'-0"	4'-0"	5'-0"	7'-0"	7'-6"	9'-0"	10'-0"	
16"	110	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	2'-0"	3'-0"	5'-0"	1'-0"	1'-0"	1'-0"	1'-6"	3'-0"	3'-0"	5'-6"	7'-6"	10'-0"
	210	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	2'-6"	3'-6"	6'-0"	1'-0"	1'-0"	1'-0"	2'-0"	3'-0"	3'-6"	6'-6"	8'-0"	11'-0"
	230	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	1'-6"	3'-0"	4'-0"	7'-0"	1'-0"	1'-0"	1'-0"	2'-0"	3'-6"	4'-0"	7'-0"	9'-0"	11'-0"
	360	1'-0"	1'-0"	1'-0"	1'-0"	2'-6"	2'-6"	4'-6"	6'-6"	9'-0"	1'-0"	1'-0"	1'-6"	3'-0"	5'-0"	5'-6"	9'-0"	10'-0"	11'-6"
	560	1'-0"	1'-0"	1'-0"	1'-0"	2'-6"	3'-0"	5'-0"	7'-6"	10'-0"	1'-0"	2'-0"	3'-0"	4'-6"	6'-6"	7'-0"	10'-0"	11'-0"	12'-0"

# Weyerhaeuser – Trus Joist - TJI

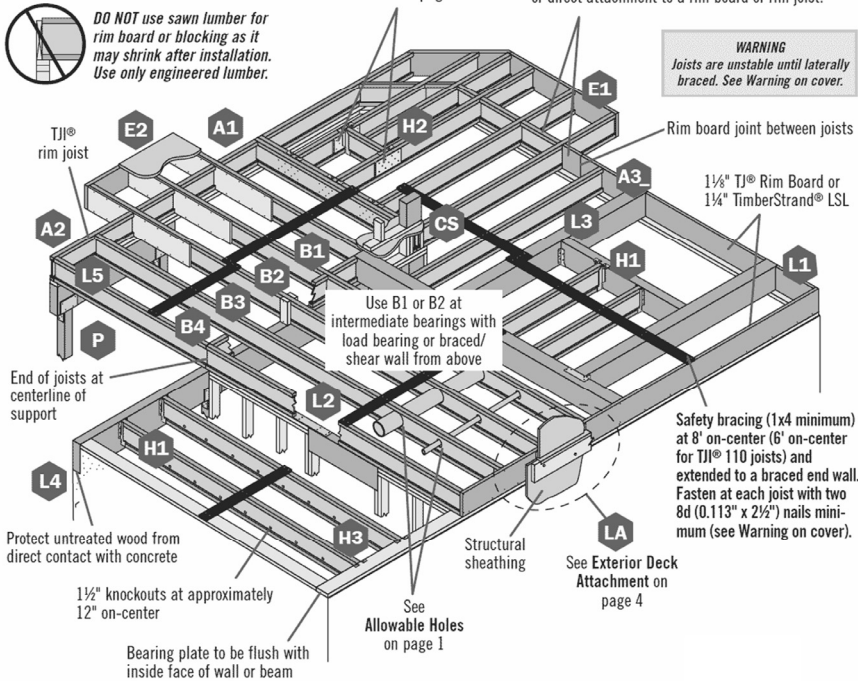
TJI® joist floor framing does not require bridging or mid-span blocking

DO NOT use sawn lumber for rim board or blocking as it may shrink after installation. Use only engineered lumber.

See Filler and Backer Blocks on page 5

Joists must be laterally supported at cantilever and end bearings by blocking panels, hangers, or direct attachment to a rim board or rim joist.

**WARNING**  
Joists are unstable until laterally braced. See Warning on cover.



# Weyerhaeuser – Trus Joist – TJI - properties

## Design Properties (100% Load Duration)

Depth	TJI®	Basic Properties				Reaction Properties							
		Joist Weight (lbs/ft)	Maximum Resistive Moment <sup>(1)</sup> (ft-lbs)	Joist Only EI x 10 <sup>6</sup> (in. <sup>2</sup> -lbs)	Maximum Vertical Shear (lbs)	1¾" End Reaction (lbs)	3½" End Reaction (lbs)	3¾" Intermediate Reaction (lbs)		5¼" Intermediate Reaction (lbs)			
								No Web Stiffeners	With Web Stiffeners <sup>(2)</sup>	No Web Stiffeners	With Web Stiffeners <sup>(2)</sup>		
9½"	110	2.3	2,500	157	1,220	910	1,220	1,935	N.A.	2,350	N.A.		
	210	2.6	3,000	186	1,330	1,005	1,330	2,145	N.A.	2,565	N.A.		
	230	2.7	3,330	206	1,330	1,060	1,330	2,410	N.A.	2,790	N.A.		
11½"	110	2.5	3,160	267	1,560	910	1,375	1,935	2,295	2,350	2,705		
	210	2.8	3,795	315	1,655	1,005	1,460	2,145	2,505	2,565	2,925		
	230	3.0	4,215	347	1,655	1,060	1,485	2,410	2,765	2,790	3,150		
	360	3.0	6,180	419	1,705	1,080	1,505	2,460	2,815	3,000	3,360		
14"	560	4.0	9,500	636	2,050	1,265	1,725	3,000	3,475	3,455	3,930		
	110	2.8	3,740	392	1,860	910	1,375	1,935	2,295	2,350	2,705		
	210	3.1	4,490	462	1,945	1,005	1,460	2,145	2,505	2,565	2,925		
	230	3.3	4,990	509	1,945	1,060	1,485	2,410	2,765	2,790	3,150		
	360	3.3	7,335	612	1,955	1,080	1,505	2,460	2,815	3,000	3,360		
16"	560	4.2	11,275	926	2,390	1,265	1,725	3,000	3,475	3,455	3,930		
	110	3.0	4,280	535	2,145	910	1,375	1,935	2,295	2,350	2,705		
	210	3.3	5,140	629	2,190	1,005	1,460	2,145	2,505	2,565	2,925		
	230	3.5	5,710	691	2,190	1,060	1,485	2,410	2,765	2,790	3,150		
	360	3.5	8,405	830	2,190	1,080	1,505	2,460	2,815	3,000	3,360		
560	4.5	12,925	1,252	2,710	1,265	1,725	3,000	3,475	3,455	3,930			

(1) **Caution: Do not** increase joist moment design properties by a repetitive member use factor.  
 (2) See detail W on page 27 for web stiffener requirements and nailing information.

- Tables are based on:
  - Uniform loads.
  - More restrictive of simple or continuous span.
  - Clear distance between supports
  - Minimum bearing length of 1¾" end (no web stiffeners) and 3½" intermediate.
- Assumed composite action with a single layer of 24" on-center span-rated, glue-nailed floor panels for deflection only. When subfloor adhesive is not applied, spans shall be reduced 6" for nails and 12" for proprietary fasteners.
- For continuous spans, ratio of short span to long span should be 0.4 or greater to prevent uplift.
- Spans generated from Weyerhaeuser software may exceed the spans shown in these tables because software reflects actual design conditions.
- For multi-family applications and other loading conditions not shown, refer to Weyerhaeuser software or to the load table on page 8.

University of Michigan, TCAUP

Wood

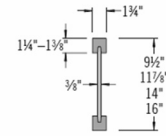
For TJI® 110, 210, 230, and 360 Joists

$$\Delta = \frac{22.5 wL^4}{EI} + \frac{2.67 wL^2}{d \times 10^5}$$

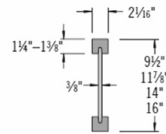
For TJI® 560 Joists

$$\Delta = \frac{22.5 wL^4}{EI} + \frac{2.29 wL^2}{d \times 10^5}$$

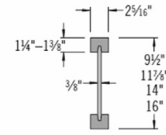
w = uniform load in pounds per linear foot  
 L = span in feet  
 d = out-to-out depth of the joist in inches  
 EI = value from table above



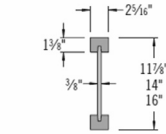
TJI® 110 joists



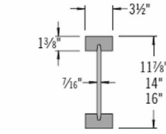
TJI® 210 joists



TJI® 230 joists



TJI® 360 joists



TJI® 560 joists

Slide 19 of 28

# Weyerhaeuser – Trus Joist – TJI – span table

## L/360 Live Load Deflection (Minimum Criteria per Code)

Depth	TJI®	40 PSF Live Load / 10 PSF Dead Load				40 PSF Live Load / 20 PSF Dead Load			
		12" o.c.	16" o.c.	19.2" o.c.	24" o.c.	12" o.c.	16" o.c.	19.2" o.c.	24" o.c.
9½"	110	18'-9"	17'-2"	15'-8"	14'-0"	18'-1"	15'-8"	14'-3"	12'-9"
	210	19'-8"	18'-0"	17'-0"	15'-4"	19'-8"	17'-2"	15'-8"	14'-0"
	230	20'-3"	18'-6"	17'-5"	16'-2"	20'-3"	18'-1"	16'-6"	14'-9"
11½"	110	22'-3"	19'-4"	17'-8"	15'-9" <sup>(1)</sup>	20'-5"	17'-8"	16'-1" <sup>(1)</sup>	14'-4" <sup>(1)</sup>
	210	23'-4"	21'-2"	19'-4"	17'-3" <sup>(1)</sup>	22'-4"	19'-4"	17'-8"	15'-9" <sup>(1)</sup>
	230	24'-0"	21'-11"	20'-5"	18'-3"	23'-7"	20'-5"	18'-7"	16'-7" <sup>(1)</sup>
	360	25'-4"	23'-2"	21'-10"	20'-4" <sup>(1)</sup>	25'-4"	23'-2"	21'-10" <sup>(1)</sup>	17'-10" <sup>(1)</sup>
	560	28'-10"	26'-3"	24'-9"	23'-0"	28'-10"	26'-3"	24'-9"	20'-11" <sup>(1)</sup>
14"	110	24'-4"	21'-0"	19'-2"	17'-2" <sup>(1)</sup>	22'-2"	19'-2"	17'-6" <sup>(1)</sup>	15'-0" <sup>(1)</sup>
	210	26'-6"	23'-1"	21'-1"	18'-10" <sup>(1)</sup>	24'-4"	21'-1"	19'-2" <sup>(1)</sup>	16'-7" <sup>(1)</sup>
	230	27'-3"	24'-4"	22'-2"	19'-10" <sup>(1)</sup>	25'-8"	22'-2"	20'-3" <sup>(1)</sup>	17'-6" <sup>(1)</sup>
	360	28'-9"	26'-3"	24'-9" <sup>(1)</sup>	21'-5" <sup>(1)</sup>	28'-9"	26'-3" <sup>(1)</sup>	22'-4" <sup>(1)</sup>	17'-10" <sup>(1)</sup>
	560	32'-8"	29'-9"	28'-0"	25'-2" <sup>(1)</sup>	32'-8"	29'-9"	26'-3" <sup>(1)</sup>	20'-11" <sup>(1)</sup>
16"	110	26'-0"	22'-6"	20'-7" <sup>(1)</sup>	18'-1" <sup>(1)</sup>	23'-9"	20'-7" <sup>(1)</sup>	18'-9" <sup>(1)</sup>	15'-0" <sup>(1)</sup>
	210	28'-6"	24'-8"	22'-6" <sup>(1)</sup>	19'-11" <sup>(1)</sup>	26'-0"	22'-6" <sup>(1)</sup>	20'-7" <sup>(1)</sup>	16'-7" <sup>(1)</sup>
	230	30'-1"	26'-0"	23'-9"	21'-1" <sup>(1)</sup>	27'-5"	23'-9"	21'-8" <sup>(1)</sup>	17'-6" <sup>(1)</sup>
	360	31'-10"	29'-0"	26'-10" <sup>(1)</sup>	21'-5" <sup>(1)</sup>	31'-10"	26'-10" <sup>(1)</sup>	22'-4" <sup>(1)</sup>	17'-10" <sup>(1)</sup>
	560	36'-1"	32'-11"	31'-0" <sup>(1)</sup>	25'-2" <sup>(1)</sup>	36'-1"	31'-6" <sup>(1)</sup>	26'-3" <sup>(1)</sup>	20'-11" <sup>(1)</sup>

(1) Web stiffeners are required at intermediate supports of continuous-span joists when the intermediate bearing length is *less* than 5¼" and the span on either side of the intermediate bearing is greater than the following spans:

**Floor—100% (PLF)**

Depth	TJI®	Joist Clear Span																	
		8'		10'		12'		14'		16'		18'		20'		22'		24'	
		Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load
9½"	110	*	190	140	152	85	127	56	99	38	76								
	210	*	210	161	169	99	141	65	119	45	90								
	230	*	236	175	190	108	158	71	133	49	99								
11½"	110	*	190	*	152	*	127	92	109	63	95	45	76						
	210	*	210	*	169	*	141	106	121	74	106	53	92						
	230	*	236	*	190	*	158	116	136	80	119	58	102	43	83				
	360	*	241	*	193	*	162	136	139	95	121	69	108	51	97	39	78		
	560	*	294	*	236	*	197	*	169	138	148	101	132	76	119	58	108	45	91
14"	110	*	190	*	152	*	127	*	109	91	95	66	85						
	210	*	210	*	169	*	141	*	121	*	106	76	94	57	85				
	230	*	236	*	190	*	158	*	136	115	119	83	106	62	95	47	81		
	360	*	241	*	193	*	162	*	139	*	121	98	108	73	97	56	88	44	81
	560	*	294	*	236	*	197	*	169	*	148	*	132	107	119	83	108	65	99
16"	110	*	190	*	152	*	127	*	109	*	95	*	85	66	76				
	210	*	210	*	169	*	141	*	121	*	106	*	94	76	85	58	77		
	230	*	236	*	190	*	158	*	136	*	119	*	106	83	95	64	87	50	78
	360	*	241	*	193	*	162	*	139	*	121	*	108	*	97	75	88	59	81
	560	*	294	*	236	*	197	*	169	*	148	*	132	*	119	*	108	86	99

\* Indicates that Total Load value controls.

**How to Use This Table**

1. Calculate actual total and live load in pounds per linear foot (plf).
2. Select appropriate Joist Clear Span.
3. Scan down the column to find a TJI® joist that meets or exceeds actual total and live loads.

Refer to PSF to PLF Conversion table on page 31

University of Michigan, TCAUP

**General Notes**

- Table is based on:
  - Minimum bearing length of 1¾" end and 3½" intermediate, without web stiffeners
  - Uniform loads.
  - More restrictive of simple or continuous span
  - No composite action provided by sheathing.
- Total Load values are limited to deflection of L/240.
- Live Load is based on joist deflection of L/480.
- If a live load deflection limit of L/360 is desired, multiply value in Live Load column by 1.33. The resulting live load must not exceed the Total Load shown.
- Table does not account for concentrated loads. Use Weyerhaeuser software when this condition applies.

Wood

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**I-Joist Selection**

procedure

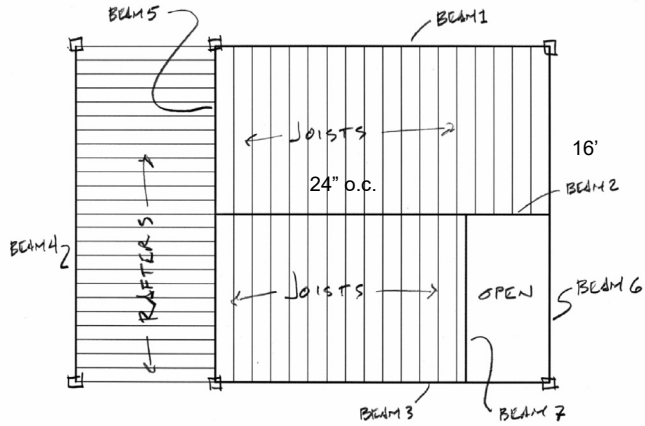
1. Calculate actual load in PLF
  2. Pick deflection limit (e.g. L/480)
  3. Pick o.c. spacing
  4. From load table find a section to carry load with span
- or
4. Calculate shear and moment
  5. Pick section from properties table
  6. Check deflection



# I-Joist Selection

## Example – floor joists

Given: span = 16 ft.  
o.c. = 24 in.  
DL 10 psf LL 40 psf



1. Find floor load in PSF
2. Pick deflection limit (e.g. L/480)
3. Pick o.c. spacing – calculate PLF
4. From load table find a section to carry load with span

CONVERT LOAD TO PLF

$$\text{PSF} \times \frac{\text{o.c.}}{12}$$

$$10 \text{ PSF} \times \frac{24}{12} = 20 \text{ PLF DL}$$

$$40 \text{ PSF} \times \frac{24}{12} = 80 \text{ PLF LL}$$

$$\underline{\underline{100 \text{ PLF TOTAL}}}$$

## Weyerhaeuser – Trus Joist - TJI

9½"-16" JOISTS		FLOOR LOAD TABLE																	
Floor—100% (PLF)																			
Depth	TJI®	Joist Clear Span																	
		8'		10'		12'		14'		16'		18'		20'		22'		24'	
		Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load	Live Load L/480	Total Load		
9½"	110	*	190	140	152	85	127	56	99	38	76								
	210	*	210	161	169	99	141	65	119	45	90								
	230	*	236	175	190	108	158	71	133	49	99								
11½"	110	*	190	*	152	*	127	92	109	63	95	45	76						
	210	*	210	*	169	*	141	106	121	74	106	53	92						
	230	*	236	*	190	*	158	116	136	80	119	58	102	43	83				
	360	*	241	*	193	*	162	136	139	95	121	69	108	51	97	39	78		
	560	*	294	*	236	*	197	*	169	138	148	101	132	76	119	58	108	45	91
14"	110	*	190	*	152	*	127	*	109	91	95	66	85						
	210	*	210	*	169	*	141	*	121	*	106	76	94	57	85				
	230	*	236	*	190	*	158	*	136	115	119	83	106	62	95	47	81		
	360	*	241	*	193	*	162	*	139	*	121	98	108	73	97	56	88	44	81
	560	*	294	*	236	*	197	*	169	*	148	*	132	107	119	83	108	65	99
16"	110	*	190	*	152	*	127	*	109	*	95	*	85	66	76				
	210	*	210	*	169	*	141	*	121	*	106	*	94	76	85	58	77		
	230	*	236	*	190	*	158	*	136	*	119	*	106	83	95	64	87	50	78
	360	*	241	*	193	*	162	*	139	*	121	*	108	*	97	75	88	59	81
	560	*	294	*	236	*	197	*	169	*	148	*	132	*	119	*	108	86	99

\* Indicates that Total Load value controls.

### How to Use This Table

1. Calculate actual total and live load in pounds per linear foot (plf).
2. Select appropriate Joist Clear Span.
3. Scan down the column to find a TJI® joist that meets or exceeds actual total and live loads.

### General Notes

- Table is based on:
  - Minimum bearing length of 1¾" end and 3½" intermediate, without web stiffeners
  - Uniform loads.
  - More restrictive of simple or continuous span
  - No composite action provided by sheathing.
- Total Load values are limited to deflection of L/240.

- Live Load is based on joist deflection of L/480.
- If a live load deflection limit of L/360 is desired, multiply value in Live Load column by 1.33. The resulting live load must not exceed the Total Load shown.
- Table does not account for concentrated loads. Use Weyerhaeuser software when this condition applies.

Refer to PSF to PLF Conversion table on page 31

# Weyerhaeuser – Trus Joist - TJI

## L/360 Live Load Deflection (Minimum Criteria per Code)

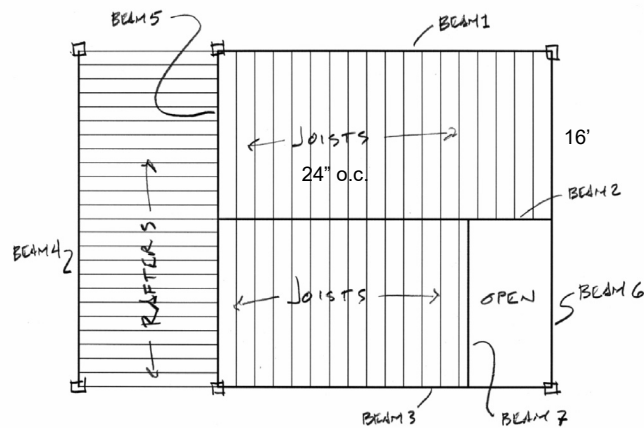
Depth	TJI®	40 PSF Live Load / 10 PSF Dead Load				40 PSF Live Load / 20 PSF Dead Load			
		12" o.c.	16" o.c.	19.2" o.c.	24" o.c.	12" o.c.	16" o.c.	19.2" o.c.	24" o.c.
9½"	110	18'-9"	17'-2"	15'-8"	14'-0"	18'-1"	15'-8"	14'-3"	12'-9"
	210	19'-8"	18'-0"	17'-0"	15'-4"	19'-8"	17'-2"	15'-8"	14'-0"
	230	20'-3"	18'-6"	17'-5"	16'-2"	20'-3"	18'-1"	16'-6"	14'-9"
11½"	110	22'-3"	19'-4"	17'-8"	15'-9" <sup>(1)</sup>	20'-5"	17'-8"	16'-1" <sup>(1)</sup>	14'-4" <sup>(1)</sup>
	210	23'-4"	21'-2"	19'-4"	17'-3" <sup>(1)</sup>	22'-4"	19'-4"	17'-8"	15'-9" <sup>(1)</sup>
	230	24'-0"	21'-11"	20'-5"	18'-3"	23'-7"	20'-5"	18'-7"	16'-7" <sup>(1)</sup>
	360	25'-4"	23'-2"	21'-10"	20'-4" <sup>(1)</sup>	25'-4"	23'-2"	21'-10" <sup>(1)</sup>	17'-10" <sup>(1)</sup>
	560	28'-10"	26'-3"	24'-9"	23'-0"	28'-10"	26'-3"	24'-9"	20'-11" <sup>(1)</sup>
14"	110	24'-4"	21'-0"	19'-2"	17'-2" <sup>(1)</sup>	22'-2"	19'-2"	17'-6" <sup>(1)</sup>	15'-0" <sup>(1)</sup>
	210	26'-6"	23'-1"	21'-1"	18'-10" <sup>(1)</sup>	24'-4"	21'-1"	19'-2" <sup>(1)</sup>	16'-7" <sup>(1)</sup>
	230	27'-3"	24'-4"	22'-2"	19'-10" <sup>(1)</sup>	25'-8"	22'-2"	20'-3" <sup>(1)</sup>	17'-6" <sup>(1)</sup>
	360	28'-9"	26'-3"	24'-9" <sup>(1)</sup>	21'-5" <sup>(1)</sup>	28'-9"	26'-3" <sup>(1)</sup>	22'-4" <sup>(1)</sup>	17'-10" <sup>(1)</sup>
	560	32'-8"	29'-9"	28'-0"	25'-2" <sup>(1)</sup>	32'-8"	29'-9"	26'-3" <sup>(1)</sup>	20'-11" <sup>(1)</sup>
16"	110	26'-0"	22'-6"	20'-7" <sup>(1)</sup>	18'-1" <sup>(1)</sup>	23'-9"	20'-7" <sup>(1)</sup>	18'-9" <sup>(1)</sup>	15'-0" <sup>(1)</sup>
	210	28'-6"	24'-8"	22'-6" <sup>(1)</sup>	19'-11" <sup>(1)</sup>	26'-0"	22'-6" <sup>(1)</sup>	20'-7" <sup>(1)</sup>	16'-7" <sup>(1)</sup>
	230	30'-1"	26'-0"	23'-9"	21'-1" <sup>(1)</sup>	27'-5"	23'-9"	21'-8" <sup>(1)</sup>	17'-6" <sup>(1)</sup>
	360	31'-10"	29'-0"	26'-10" <sup>(1)</sup>	21'-5" <sup>(1)</sup>	31'-10"	26'-10" <sup>(1)</sup>	22'-4" <sup>(1)</sup>	17'-10" <sup>(1)</sup>
	560	36'-1"	32'-11"	31'-0" <sup>(1)</sup>	25'-2" <sup>(1)</sup>	36'-1"	31'-6" <sup>(1)</sup>	26'-3" <sup>(1)</sup>	20'-11" <sup>(1)</sup>

(1) Web stiffeners are required at intermediate supports of continuous-span joists when the intermediate bearing length is *less* than 5¼" and the span on either side of the intermediate bearing is greater than the following spans:

## I-Joist Selection

Example – floor joists

Given: span = 16 ft.  
o.c. = 24 in.  
DL 10 psf LL 40 psf



1. Calculate actual load in PLF
2. Pick deflection limit (e.g. L/360)
3. Pick o.c. spacing
4. Calculate shear and moment
5. Pick section from properties table
6. Calculate deflection

$$M_{\text{E}} = \frac{wl^2}{8} = \frac{100 \text{ PLF} (16')^2}{8} = 3200 \text{ l-ft}$$

$$V_{\text{max}} = \frac{wl}{2} = \frac{100 (16)}{2} = 800 \text{ #}$$

# Weyerhaeuser – Trus Joist - TJI

## Design Properties (100% Load Duration)

Depth	TJI®	Basic Properties				Reaction Properties							
		Joist Weight (lbs/ft)	Maximum Resistive Moment <sup>(1)</sup> (ft-lbs)	Joist Only EI x 10 <sup>6</sup> (in. <sup>2</sup> -lbs)	Maximum Vertical Shear (lbs)	1 3/4" End Reaction (lbs)	3 1/2" End Reaction (lbs)	3 3/2" Intermediate Reaction (lbs)		5 1/2" Intermediate Reaction (lbs)			
								No Web Stiffeners	With Web Stiffeners <sup>(2)</sup>	No Web Stiffeners	With Web Stiffeners <sup>(2)</sup>		
9 1/2"	110	2.3	2,500	157	1,220	910	1,220	1,935	N.A.	2,350	N.A.		
	210	2.6	3,000	186	1,330	1,005	1,330	2,145	N.A.	2,565	N.A.		
	230	2.7	3,330	206	1,330	1,060	1,330	2,410	N.A.	2,790	N.A.		
11 1/2"	110	2.5	3,160	267	1,560	910	1,375	1,935	2,295	2,350	2,705		
	210	2.8	3,795	315	1,655	1,005	1,460	2,145	2,505	2,565	2,925		
	230	3.0	4,215	347	1,655	1,060	1,485	2,410	2,765	2,790	3,150		
	360	3.0	6,180	419	1,705	1,080	1,505	2,460	2,815	3,000	3,360		
	560	4.0	9,500	636	2,050	1,265	1,725	3,000	3,475	3,455	3,930		
14"	110	2.8	3,740	392	1,860	910	1,375	1,935	2,295	2,350	2,705		
	210	3.1	4,490	462	1,945	1,005	1,460	2,145	2,505	2,565	2,925		
	230	3.3	4,990	509	1,945	1,060	1,485	2,410	2,765	2,790	3,150		
	360	3.3	7,335	612	1,955	1,080	1,505	2,460	2,815	3,000	3,360		
	560	4.2	11,275	926	2,390	1,265	1,725	3,000	3,475	3,455	3,930		
16"	110	3.0	4,280	535	2,145	910	1,375	1,935	2,295	2,350	2,705		
	210	3.3	5,140	629	2,190	1,005	1,460	2,145	2,505	2,565	2,925		
	230	3.5	5,710	691	2,190	1,060	1,485	2,410	2,765	2,790	3,150		
	360	3.5	8,405	830	2,190	1,080	1,505	2,460	2,815	3,000	3,360		
	560	4.5	12,925	1,252	2,710	1,265	1,725	3,000	3,475	3,455	3,930		

- (1) **Caution: Do not** increase joist moment design properties by a repetitive member use factor.  
 (2) See detail W on page 27 for web stiffener requirements and nailing information.

- Tables are based on:
  - Uniform loads.
  - More restrictive of simple or continuous span.
  - Clear distance between supports
  - Minimum bearing length of 1 3/4" end (no web stiffeners) and 3 1/2" intermediate.
- Assumed composite action with a single layer of 24" on-center span-rated, glue-nailed floor panels for deflection only. When subfloor adhesive is not applied, spans shall be reduced 6" for nails and 12" for proprietary fasteners.
- For continuous spans, ratio of short span to long span should be 0.4 or greater to prevent uplift.
- Spans generated from Weyerhaeuser software may exceed the spans shown in these tables because software reflects actual design conditions.
- For multi-family applications and other loading conditions not shown, refer to Weyerhaeuser software or to the load table on page 8.

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Wood

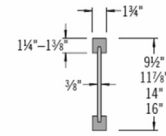
### For TJI® 110, 210, 230, and 360 Joists

$$\Delta = \frac{22.5 wL^4}{EI} + \frac{2.67 wL^2}{d \times 10^5}$$

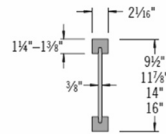
### For TJI® 560 Joists

$$\Delta = \frac{22.5 wL^4}{EI} + \frac{2.29 wL^2}{d \times 10^5}$$

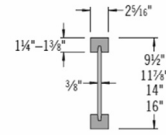
w = uniform load in pounds per linear foot  
 L = span in feet  
 d = out-to-out depth of the joist in inches  
 EI = value from table above



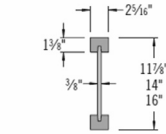
TJI® 110 joists



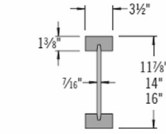
TJI® 210 joists



TJI® 230 joists



TJI® 360 joists



TJI® 560 joists

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# Weyerhaeuser – Trus Joist - TJI

- Tables are based on:
  - Uniform loads.
  - More restrictive of simple or continuous span.
  - Clear distance between supports
  - Minimum bearing length of 1 3/4" end (no web stiffeners) and 3 1/2" intermediate.
- Assumed composite action with a single layer of 24" on-center span-rated, glue-nailed floor panels for deflection only. When subfloor adhesive is not applied, spans shall be reduced 6" for nails and 12" for proprietary fasteners.
- For continuous spans, ratio of short span to long span should be 0.4 or greater to prevent uplift.
- Spans generated from Weyerhaeuser software may exceed the spans shown in these tables because software reflects actual design conditions.
- For multi-family applications and other loading conditions not shown, refer to Weyerhaeuser software or to the load table on page 8.

## 9.5" TJI 230 (without composite flooring)

$$\Delta_{LL} = \frac{22.5(80PLF)(16)^4}{206000000} + \frac{2.67(80PLF)16^2}{9.5" \times 1000000} = 0.5726" + 0.0058" = 0.578"$$

$$\frac{f}{360} = \frac{16'(12)}{360} = 0.53"$$

University of Michigan, TCAUP

Wood

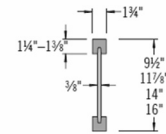
### For TJI® 110, 210, 230, and 360 Joists

$$\Delta = \frac{22.5 wL^4}{EI} + \frac{2.67 wL^2}{d \times 10^5}$$

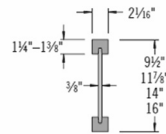
### For TJI® 560 Joists

$$\Delta = \frac{22.5 wL^4}{EI} + \frac{2.29 wL^2}{d \times 10^5}$$

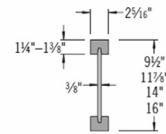
w = uniform load in pounds per linear foot  
 L = span in feet  
 d = out-to-out depth of the joist in inches  
 EI = value from table above



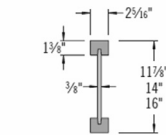
TJI® 110 joists



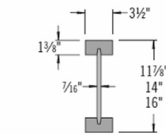
TJI® 210 joists



TJI® 230 joists



TJI® 360 joists



TJI® 560 joists

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