

Products: Nordic Structures Prefabricated Wood I-Joists
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1. Basis of the product report:
 - 2021, 2018, 2015, and 2012 International Building Code (IBC): Sections 104.11 Alternative materials and 2303.1.2 Prefabricated wood I-joists
 - 2021, 2018, and 2015 International Residential Code (IRC): Sections 104.11 Alternative materials, R502.1.2, and R802.1.8 (2021 and 2018 IRC only) Prefabricated wood I-joists
 - 2012 IRC: Sections R104.11 Alternative materials and R502.1.4 Prefabricated wood I-joists
 - ASTM D5055-16, D5055-13e1, D5055-13, and D5055-09 recognized by the 2021 IBC and IRC, 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
 - PRI-400 Performance Standard for APA EWS I-Joists
 - ANSI/AWC SDPWS-2021 Special Design Provisions for Wind and Seismic
 - APA Reports T2004P-3, T2004P-21, T2004P-74, T2004P-76, T2005P-30, T2005P-31, T2006P-12, T2006P-13, T2007P-14A, T2007P-76, T2007P-79A, T2007P-81, T2007P-91, T2008P-17, T2010P-20, T2013P-05, T2013P-37, T2015L-05B, T2017L-25, and T2019P-46, and other qualification data
2. Product description:

Nordic Joist™ Series I-joists, as described in Table 1, are made with lumber flanges and OSB webs in accordance with the in-plant manufacturing standard approved by APA. The Nordic Joist Series are also qualified for PRI-400 Joist Series as shown in Table 1.
3. Design properties:

Tables 2 and 3 list the allowable design properties for Nordic Joist Series I-joists. Table 4 shows the allowable lateral shear capacities of Nordic Joist Series I-joists in diaphragm applications. Table 5 shows web stiffener information. The allowable spans shall be in accordance with the recommendations provided by the manufacturer (www.nordic.ca/en/documentation/technical-documents) and APA Design/Construction Guide, *Performance Rated I-Joists*, Form Z725 (www.apawood.org/resource-library) for products contained in the PRI Series.

Design values for the Load and Resistance Factor Design (LRFD) used in the U.S. for Nordic Joist Series I-joists can be derived from the ASD values published in Tables 2 and 3 of this report in accordance with Tables 7.3.1, N1, N2, and N3 of the 2018 ANSI/AWC NDS.
4. Product installation:

Nordic Joist Series I-joists shall be installed in accordance with the recommendations provided by the manufacturer (see link above) and APA Design/Construction Guide, *Performance Rated I-Joist Roof Framing Details*, Form D710 (see link above). Permissible web holes, web stiffeners and cantilever reinforcements shall be in accordance with the recommendations provided by the manufacturer and APA D710 for products contained in the PRI Series.

5. Fire-rated assemblies:
 Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer (see link above), APA Product Report PR-S274 (see link above), or APA Design/Construction Guide, *Fire-Rated Systems*, Form W305 (see link above) for products contained in the PRI Series.

6. Limitations:
 - a) Nordic Joist Series I-joists shall be designed in accordance with the code using the design properties specified in this report.
 - b) Nordic Joist Series I-joists are limited to dry service conditions where the average equilibrium moisture content of sawn lumber is less than 16%.
 - c) Nordic Joist Series I-joists are produced at the Nordic Structures facility in Chibougamau, Québec under a quality assurance program audited by APA.
 - d) This report is subject to re-examination in one year.

7. Identification:
 The Nordic Joist Series I-joists described in this report are identified by a label bearing the manufacturer's name (Nordic Structures) and/or trademark, the APA assigned plant number (1052), the I-joist series, the APA logo, the report number PR-L274, and a means of identifying the date of manufacture.

Table 1. Description of Nordic Joist Series I-Joists^(a)

Joist Series	Also Qualified for ^(b)	Joist Depths (in.)	Flanges				Web	
			Material	G ^(c)	Dimension		Material	Thick-ness (in.)
					Depth (in.)	Width (in.)		
NI-20	PRI-20	9-1/4 - 11-7/8	Proprietary SPF	0.42	1-1/2	2-1/2	OSB	3/8
NI-40	PRI-40	9-1/2 - 16	Proprietary SPF	0.42	1-1/2	2-1/2	OSB	3/8
NI-40x	PRI-40	7-7/8 - 16	Proprietary SPF	0.42	1-1/2	2-1/2	OSB	3/8
NI-60	PRI-60	7-7/8 - 18	MSR SPF	0.46	1-1/2	2-1/2	OSB	3/8
NI-70	PRI-70	9-1/2 - 16	MSR SPF	0.42	1-1/2	3-1/2	OSB	3/8
NI-80	PRI-80	7-7/8 - 16	MSR SPF	0.46	1-1/2	3-1/2	OSB	3/8
NI-80x	NA	18 - 24	MSR SPF	0.46	1-1/2	3-1/2	OSB	7/16
NI-90	PRI-90	11-7/8 - 16	Proprietary SPF	0.50	1-1/2	3-1/2	OSB	7/16
NI-90x	NA	11-7/8 - 16	Proprietary SPF	0.42	2	3-1/2	OSB	7/16

- ^(a) Referenced dimensions are nominal. Tolerances are as specified in the in-plant quality manual.
- ^(b) Applicable to 9-1/2, 11-7/8, 14, and 16-inch PRI-20, PRI-40, and PRI-60, and 11-7/8, 14, and 16-inch PRI-70, PRI-80, and PRI-90.
- ^(c) Specific gravity of flanges for use in diaphragm design (see Table 4) based on oven-dry weight and oven-dry volume.

Table 2. Design Properties (Allowable Stress Design) for Nordic Joist Series I-Joists^(a)

Joist Depth (in.)	Joist Series	EI ^(b) (10 ⁶ lbf-in. ²)	M ^(c) (lbf-ft)	V ^(d) (lbf)	VLC ^(e) (lbf/ft)	K ^(f) (10 ⁶ lbf)
7-7/8	NI-40x	138	2,310	880	2,000	4.10
	NI-60	147	3,030	880	2,000	4.10
	NI-80	204	4,285	880	2,000	4.10
9-1/4	NI-20	138	2,510	1,080	2,000	4.81
	NI-40x	198	2,810	1,170	2,000	4.81
	NI-60	217	3,680	1,170	2,000	4.81
9-1/2	NI-80	304	5,215	1,170	2,000	4.81
	NI-20	145	2,590	1,120	2,000	4.94
	NI-40	193	2,735	1,200	2,000	4.94
9-1/2	NI-40x	218	2,900	1,200	2,000	4.94
	NI-60	231	3,810	1,200	2,000	4.94
	NI-70	304	5,120	1,200	2,000	4.94
11-1/4	NI-80	324	5,385	1,200	2,000	4.94
	NI-20	222	3,155	1,340	2,000	5.85
	NI-40x	313	3,535	1,410	2,000	5.85
11-1/4	NI-60	347	4,630	1,410	2,000	5.85
	NI-80	484	6,560	1,410	2,000	5.85
	NI-20	253	3,355	1,420	2,000	6.18
11-7/8	NI-40	330	3,545	1,480	2,000	6.18
	NI-40x	371	3,760	1,480	2,000	6.18
	NI-60	396	4,935	1,480	2,000	6.18
11-7/8	NI-70	515	6,635	1,480	2,000	6.18
	NI-80	547	6,980	1,480	2,000	6.18
	NI-90	601	8,780	1,925	2,000	6.18
11-7/8	NI-90x	615	9,465	2,055	2,000	6.18
	NI-40	482	4,270	1,730	2,000	7.28
	NI-40x	540	4,530	1,730	2,000	7.28
14	NI-60	584	5,945	1,730	2,000	7.28
	NI-70	749	7,990	1,730	2,000	7.28
	NI-80	802	8,405	1,730	2,000	7.28
14	NI-90	877	10,570	2,125	2,000	7.28
	NI-90x	910	11,415	2,210	2,000	7.28
	NI-40	657	4,950	1,970	2,000	8.32
16	NI-40x	734	5,250	1,970	2,000	8.32
	NI-60	799	6,895	1,970	2,000	8.32
	NI-70	1,015	9,265	1,970	2,000	8.32
16	NI-80	1,092	9,745	1,970	2,000	8.32
	NI-90	1,187	12,260	2,330	2,000	8.32
	NI-90x	1,245	13,100	2,330	2,000	8.32
18	NI-60	1,019	7,800	2,000	1,850	9.36
	NI-80x	1,399	10,990	2,360	1,275	9.36
20	NI-80x	1,771	12,315	2,450	1,275	10.40
22	NI-80x	2,191	13,645	2,530	1,275	11.44
24	NI-80x	2,660	14,975	2,600	1,275	12.48

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 lbf-ft = 1.356 N-m, 1 lbf-in² = 0.000287 N-m²

- (a) The tabulated values are design values for normal duration of load. All values, except for EI, VLC, and K, shall be permitted to be adjusted for other load durations as permitted by the code.
- (b) Bending stiffness (EI) of the I-joist.
- (c) Moment capacity (M) of the I-joist.
- (d) Shear capacity (V) of the I-joist.
- (e) Uniform vertical load capacity of the I-joist.

- (f) Coefficient of shear deflection (K). For calculating uniform load and center-point load deflections of the I-joist in a simple-span application, use Equations 1 and 2.

$$\text{Uniform Load: } \delta = \frac{5 \omega L^4}{384 EI} + \frac{\omega L^2}{K} \quad [1]$$

$$\text{Center-Point Load: } \delta = \frac{PL^3}{48 EI} + \frac{2 PL}{K} \quad [2]$$

where δ = calculated deflection (in.), ω = uniform load (lbf/in.),
P = concentrated load (lbf), L = design span (in.),
EI = bending stiffness of the I-joist (lbf-in.²), and K = coefficient of shear deflection (lbf).

Table 3. Reaction Capacities (Allowable Stress Design) for Nordic Joist Series I-Joists^(a,b,c,d)

Joist Depth (in.)	Joist Series	Intermediate Reaction (lbf)				End Reaction (lbf)						Flange Bearing Capacity (lbf/in.)
		3-1/2 in. Brg. Length		5-1/2 in. Brg. Length		1-1/2 in. Brg. Length		1-3/4 in. Brg. Length		4 in. Brg. Length		
		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		
		No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	
7-7/8	NI-40x	2,010	2,010	2,010	2,010	NA	NA	880	880	880	880	955
	NI-60	2,010	2,010	2,010	2,010	NA	NA	880	880	880	880	1,180
	NI-80	2,010	2,010	2,010	2,010	NA	NA	880	880	880	880	1,705
9-1/4	NI-20	2,350	2,360	2,510	2,510	NA	NA	1,015	1,015	1,080	1,080	955
	NI-40x	2,350	2,360	2,535	2,550	NA	NA	1,135	1,135	1,170	1,170	955
	NI-60	2,350	2,375	2,540	2,550	NA	NA	1,135	1,135	1,170	1,170	1,180
9-1/2	NI-80	2,350	2,570	2,580	2,580	NA	NA	1,170	1,170	1,170	1,170	1,705
	NI-20	2,410	2,425	2,575	2,575	1,035	1,035	1,035	1,035	1,120	1,120	955
	NI-40	2,410	2,425	2,630	2,645	1,060	1,200	1,175	1,200	1,200	1,200	955
	NI-40x	2,410	2,425	2,630	2,645	1,060	1,200	1,175	1,200	1,200	1,200	955
	NI-60	2,415	2,440	2,635	2,665	1,060	1,200	1,175	1,200	1,200	1,200	1,180
11-1/4	NI-70	2,415	2,670	2,685	2,685	1,060	1,200	1,200	1,200	1,200	1,200	1,705
	NI-80	2,415	2,670	2,685	2,685	1,060	1,200	1,200	1,200	1,200	1,200	1,705
	NI-20	2,845	2,870	3,045	3,045	1,050	1,050	1,190	1,190	1,340	1,340	955
	NI-40x	2,845	2,870	3,300	3,330	1,105	1,410	1,250	1,410	1,410	1,410	955
	NI-60	2,850	2,905	3,310	3,375	1,105	1,410	1,250	1,410	1,410	1,410	1,180
11-7/8	NI-80	2,850	3,155	3,410	3,410	1,105	1,410	1,330	1,410	1,410	1,410	1,705
	NI-20	3,000	3,030	3,215	3,215	1,055	1,055	1,245	1,245	1,420	1,420	955
	NI-40	3,000	3,030	3,540	3,575	1,125	1,330	1,275	1,480	1,480	1,480	955
	NI-40x	3,000	3,030	3,540	3,575	1,125	1,330	1,275	1,480	1,480	1,480	955
	NI-60	3,005	3,070	3,550	3,625	1,125	1,330	1,275	1,480	1,480	1,480	1,180
	NI-70	3,005	3,330	3,670	3,670	1,125	1,330	1,350	1,480	1,480	1,480	1,705
	NI-80	3,005	3,330	3,670	3,670	1,125	1,330	1,350	1,480	1,480	1,480	1,705
	NI-90	3,355	3,355	3,670	3,670	1,125	1,330	1,400	1,480	1,885	1,925	2,000
14	NI-90x	4,170	4,170	4,170	4,170	1,125	1,330	1,765	2,055	1,885	2,055	1,380
	NI-40	3,130	3,160	3,530	3,565	1,180	1,665	1,325	1,690	1,550	1,730	955
	NI-40x	3,130	3,160	3,530	3,565	1,180	1,665	1,325	1,690	1,550	1,730	955
	NI-60	3,140	3,260	3,540	3,795	1,180	1,665	1,345	1,690	1,550	1,730	1,180
	NI-70	3,330	3,640	3,820	4,075	1,180	1,665	1,455	1,690	1,550	1,730	1,705
	NI-80	3,330	3,640	3,820	4,075	1,180	1,665	1,455	1,690	1,550	1,730	1,705
	NI-90	3,355	3,640	3,820	4,075	1,180	1,665	1,455	1,690	1,885	2,125	2,000
	NI-90x	4,170	4,170	4,170	4,170	1,180	1,665	1,800	2,210	1,885	2,210	1,380

(Footnotes on following page)

Table 3. Reaction Capacities (Allowable Stress Design) for Nordic Joist Series I-Joists^(a,b,c,d) (Continued)

Joist Depth (in.)	Joist Series	Intermediate Reaction (lbf)				End Reaction (lbf)						Flange Bearing Capacity (lbf/in.)
		3-1/2 in. Brg. Length		5-1/2 in. Brg. Length		1-1/2 in. Brg. Length		1-3/4 in. Brg. Length		4 in. Brg. Length		
		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		
		No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	
16	NI-40	3,255	3,285	3,520	3,555	NA	NA	1,370	1,875	1,550	1,970	955
	NI-40x	3,255	3,285	3,520	3,555	NA	NA	1,370	1,875	1,550	1,970	955
	NI-60	3,265	3,440	3,530	3,955	NA	NA	1,410	1,875	1,550	1,970	1,180
	NI-70	3,640	3,930	3,960	4,455	NA	NA	1,550	1,875	1,550	1,970	1,705
	NI-80	3,640	3,930	3,960	4,455	NA	NA	1,550	1,875	1,550	1,970	1,705
	NI-90	3,640	3,930	3,960	4,455	NA	NA	1,550	1,875	1,885	2,330	2,000
18	NI-90x	4,170	4,170	4,170	4,170	NA	NA	1,830	2,325	1,885	2,330	1,380
	NI-60	2,800	3,620	3,260	4,115	NA	NA	1,475	2,000	1,850	2,000	1,180
	NI-80x	3,115	3,820	3,280	4,420	NA	NA	1,300	1,900	1,850	2,360	1,705
20	NI-80x	3,190	4,120	3,410	4,575	NA	NA	1,320	2,045	1,900	2,450	1,705
22	NI-80x	3,265	4,425	3,535	4,730	NA	NA	1,340	2,195	1,950	2,530	1,705
24	NI-80x	3,340	4,725	3,665	4,885	NA	NA	1,360	2,340	2,000	2,600	1,705

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 lbf/in. = 0.175 kN/m

- (a) Reaction capacity shall be limited by the flange bearing capacity or the bearing capacity of the support material, whichever is less. The flange bearing capacity, per inch of bearing length, is based on the allowable compression perpendicular-to-grain of the I-joist flange, accounting for eased edges.
- (b) Reaction capacity is for normal duration of load and shall be permitted to be adjusted for other load durations provided that the adjusted reaction capacity is not greater than the flange bearing capacity or the bearing capacity of the support material, which shall not be increased for any load durations.
- (c) Reaction capacity shall be permitted to be increased over that tabulated for the minimum bearing length by linear interpolation of the reaction capacity between the minimum and maximum bearing lengths. Extrapolation beyond the minimum and maximum bearing lengths is beyond the scope of this table.
- (d) Web stiffeners, when required, shall be installed in accordance with Table 5 and the recommendations provided by the manufacturer.

Table 4. Allowable Shear (Pounds Per Foot) for Horizontal Wood Structural Panel Diaphragms Framed With Nordic Joist Series I-Joists for Wind^(a) or Seismic Loading^(b,c)

Panel Grade	Common Nail Size	Minimum Nominal Panel Thickness (in.)	Minimum Nominal Width of Framing Members at Adjoining Panel Edges and Boundaries ^(e) (in.)	Blocked Diaphragms			Unblocked Diaphragms	
				Nail spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6) ^(f,g)			Nails Spaced 6 in. max. at supported edges ^(f,g)	
				6	4 ^(h)	2-1/2 ⁽ⁱ⁾	Case 1 (No unblocked edges or continuous joints parallel to load)	All other configurations (Cases 2, 3, 4, 5 & 6)
				Nail spacing (in.) at other panel edges (Cases 1, 2, 3, & 4) ^(e)				
				6	6	4		
Structural I Grades	6d ^(d)	5/16	3	210	280	420	185	140
	8d	3/8		300	400	600	265	200
	10d	15/32		360	480	720	320	240
Sheathing, single floor and other grades covered in DOC PS 1 and PS 2	6d ^(d)	5/16		190	250	380	170	125
		3/8		210	280	420	185	140
	8d	3/8		270	360	540	240	180
		7/16		285	380	570	255	190
		15/32		300	400	600	265	200
	10d	15/32		325	430	650	290	215
		19/32		360	480	720	320	240

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf = 4.448 N, 1 lbf/ft = 0.0146 N/mm.

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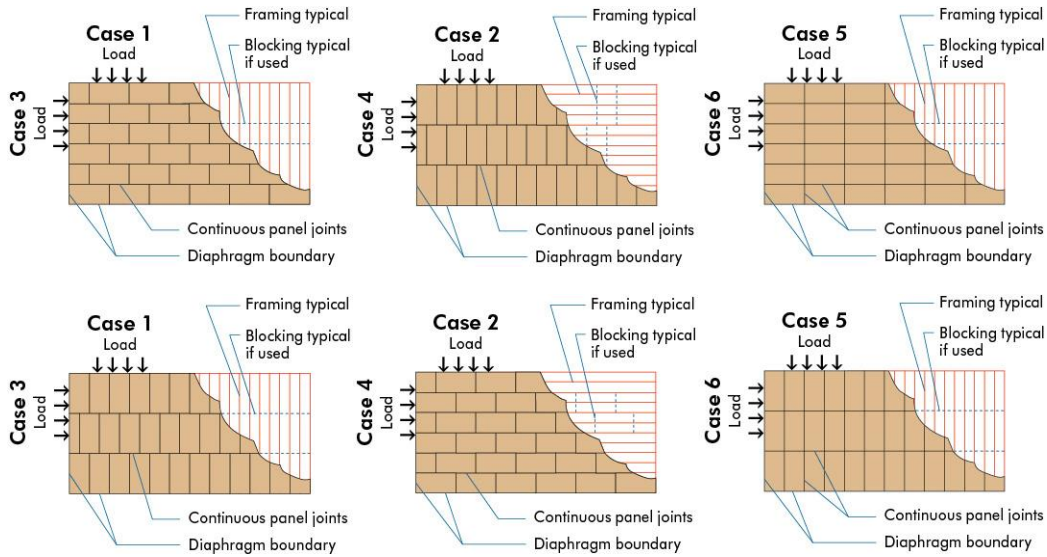


Figure 1. Diaphragm configurations

- (a) For wind load applications, the values in the table above shall be permitted to be multiplied by 1.4.
- (b) For shear loads of normal or permanent load duration as defined by the NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.
- (c) The tabulated allowable shear capacities are for I-joist series with flanges having a specific gravity (G) of 0.50 or higher (see Table 1). For $G < 0.50$ the allowable shear capacities shall be reduced by multiplying the allowable shear capacities by the Specific Gravity Adjustment Factor = $[1 - (0.5 - G)]$. The Specific Gravity Adjustment Factor shall not be greater than 1.
- (d) 8d common nails minimum are recommended for roofs due to negative pressures of high winds.
- (e) The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be 2 inches.
- (f) Space nails maximum 12 inches o.c. along intermediate framing members (6 inches o.c. when supports are spaced 48 inches o.c. or greater).
- (g) Fasteners shall be located 3/8 inch from panel edges (see Figures 2, 3 and 4).
- (h) Adjacent nails within a row must be staggered 1/2 inch when nail spacing is 4 inches or less (see Figure 3)
- (i) Adjacent nails within a row must be staggered 1/2 inch at adjoining panel edges when nail spacing is 2-1/2 inches o.c. (see Figure 4).

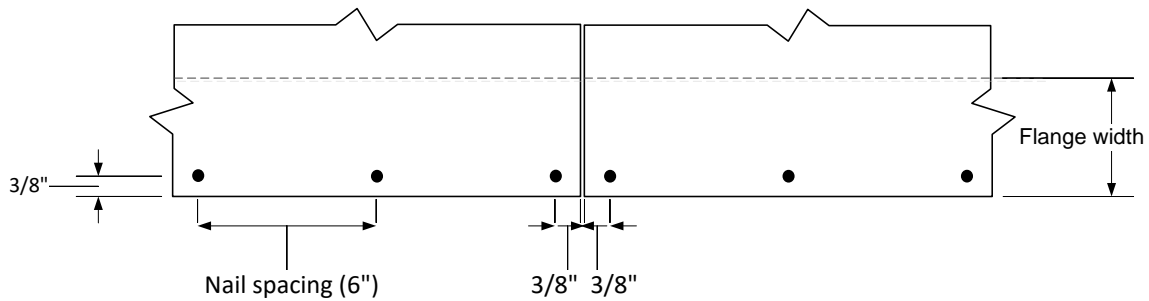


Figure 2. Non-staggered nails at diaphragm boundaries (see Footnote g), not to scale.

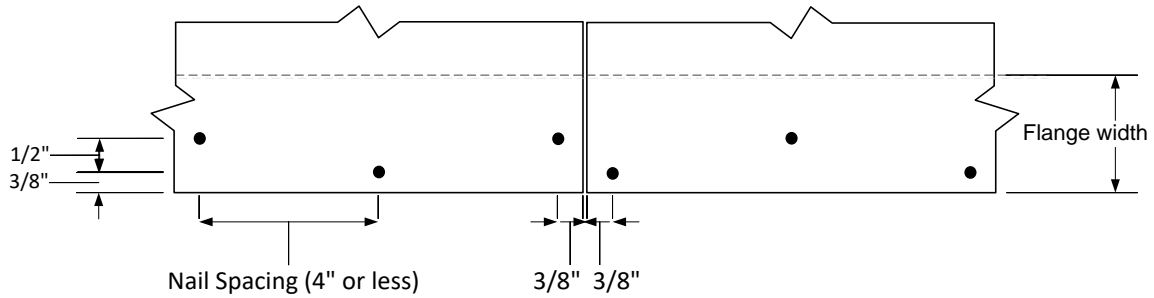


Figure 3. Staggered nails at diaphragm boundaries (see Footnote h), not to scale.

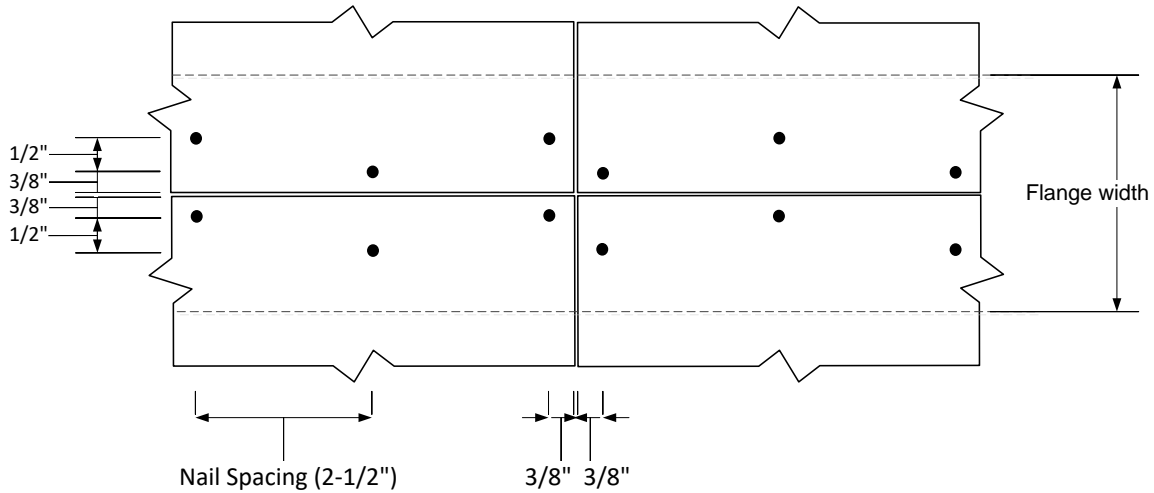


Figure 4. Staggered nails at adjoining panel edges (see Footnote i), not to scale.

Table 5. Minimum Dimensions for Web Stiffeners^(a)

Joist Series	Web Stiffeners		Flange width, b_f (in.)
	Thickness (in.)	Width (in.)	
NI-20	1	2-5/16	2-1/2
NI-40	1	2-5/16	2-1/2
NI-40x	1	2-5/16	2-1/2
NI-60	1	2-5/16	2-1/2
NI-70	1-1/2	2-5/16	3-1/2
NI-80	1-1/2	2-5/16	3-1/2
NI-80x	1-1/2	2-5/16	3-1/2
NI-90	1-1/2	2-5/16	3-1/2
NI-90x	1-1/2	2-5/16	3-1/2

^(a) Web stiffener length is 1/8 to 1/4 inch less than the clear distance between flanges. Stiffeners 1-inch thick are wood structural panels and stiffeners 1-1/2-inch thick are SPF lumber (specific gravity of 0.42) or denser lumber.

APA – The Engineered Wood Association is an approved national standards developer accredited by American National Standards Institute (ANSI). APA publishes ANSI standards and Voluntary Product Standards for wood structural panels and engineered wood products. APA is an accredited certification body under ISO/IEC 17065 by Standards Council of Canada (SCC), an accredited inspection agency under ISO/IEC 17020 by International Code Council (ICC) International Accreditation Service (IAS), and an accredited testing organization under ISO/IEC 17025 by IAS. APA is also an approved Product Certification Agency, Testing Laboratory, Quality Assurance Entity, and Validation Entity by the State of Florida, and an approved testing laboratory by City of Los Angeles.

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