

Nordic Joist™
Nordic Structures

PR-L274C

Revised April 16, 2017

Products: NI-20, 40, 40x, 60, 70, 80, 80x, 90, and 90x Prefabricated Wood I-Joists
Nordic Structures

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1. Basis of the product report:
 - 2015 National Building Code of Canada (NBCC): Clause 1.2.1.1 of Division A and Clauses 4.1, 4.3.1.1, and 9.23.4.2 of Division B
 - CSA O86-14 (reprint 2016) Engineering Design in Wood
 - ASTM D5055-13e1 recognized by CSA O86-14 (reprint 2016)
 - PRI-400 Performance Standard for APA EWS I-Joists
 - 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, and T2013-37, 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 factored resistances for Nordic Joist Series I-joists. The maximum spans shall be in accordance with the recommendations provided by the manufacturer (www.nordic.ca/en/documentation/technical-documents) and with APA Design & Construction Guide, *Performance Rated I-Joists*, Form Z725 (www.apawood.org/resource-library) for products contained in the PRI Series.
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, *I-Joist Construction 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), Table 9.10.3.1.-B of NBCC, 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 as defined in CSA O86, at which the average equilibrium moisture content of solid-sawn lumber over a year is 15 percent or less and does not exceed 19 percent.

- 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, mm (in.)	Flanges			Web	
			Material	Dimension		Material	Thickness, mm (in.)
				Depth, mm (in.)	Width, mm (in.)		
NI-20	PRI-20	235 – 302 (9-1/4 – 11-7/8)	Proprietary SPF	38 (1-1/2)	64 (2-1/2)	OSB	9.5 (3/8)
NI-40	PRI-40	241 – 406 (9-1/2 – 16)	Proprietary SPF	38 (1-1/2)	64 (2-1/2)	OSB	9.5 (3/8)
NI-40x	PRI-40	200 - 406 (7-7/8 – 16)	Proprietary SPF	38 (1-1/2)	64 (2-1/2)	OSB	9.5 (3/8)
NI-60	PRI-60	200 – 457 (7-7/8 – 18)	MSR SPF	38 (1-1/2)	64 (2-1/2)	OSB	9.5 (3/8)
NI-70	PRI-70	241 – 406 (9-1/2 – 16)	MSR SPF	38 (1-1/2)	89 (3-1/2)	OSB	9.5 (3/8)
NI-80	PRI-80	200 – 406 (7-7/8 – 16)	MSR SPF	38 (1-1/2)	89 (3-1/2)	OSB	9.5 (3/8)
NI-80x	NA	457 – 610 (18 – 24)	MSR SPF	38 (1-1/2)	89 (3-1/2)	OSB	11 (7/16)
NI-90	PRI-90	302 – 406 (11-7/8 – 16)	Proprietary SPF	38 (1-1/2)	89 (3-1/2)	OSB	11 (7/16)
NI-90x	NA	302 – 406 (11-7/8 – 16)	Proprietary SPF	51 (2)	89 (3-1/2)	OSB	11 (7/16)

^(a) Referenced dimensions are nominal. Tolerances are as specified in the in-plant quality manual.

^(b) Applicable to 241 mm (9-1/2 in.), 302 mm (11-7/8 in.), 356 mm (14 in.), and 406 mm (16 in.) PRI-20, PRI-40, and PRI-60, and 302 mm (11-7/8 in.), 356 mm (14 in.), and 406 mm (16 in.) PRI-70, PRI-80, and PRI-90.

Table 2. Factored Resistances for Nordic Joist™ Series I-Joists^(a)

Joist Depth, mm (in.)	Joist Series	EI ^(b) (10 ⁶ kN-mm ²)	M _r ^(c) (kN-mm)	V _r ^(d) (kN)	VLC _r ^(e) (kN/m)	K ^(f) (kN)
200 (7-7/8)	NI-40x	396	5,210	6.18	48.7	18,240
	NI-60	422	6,835	6.18	48.7	18,240
	NI-80	585	9,665	6.18	48.7	18,240
235 (9-1/4)	NI-20	396	5,660	7.58	48.7	21,400
	NI-40x	568	6,335	8.21	48.7	21,400
	NI-60	623	8,300	8.21	48.7	21,400
	NI-80	872	11,760	8.21	48.7	21,400
241 (9-1/2)	NI-20	416	5,840	7.86	48.7	21,970
	NI-40	554	6,165	8.43	48.7	21,970
	NI-40x	626	6,540	8.43	48.7	21,970
	NI-60	663	8,590	8.43	48.7	21,970
	NI-70	872	11,545	8.43	48.7	21,970
	NI-80	930	12,145	8.43	48.7	21,970
286 (11-1/4)	NI-20	637	7,115	9.41	48.7	26,020
	NI-40x	898	7,970	9.90	48.7	26,020
	NI-60	996	10,440	9.90	48.7	26,020
	NI-80	1,389	14,795	9.90	48.7	26,020
302 (11-7/8)	NI-20	726	7,565	9.97	48.7	27,490
	NI-40	947	7,995	10.39	48.7	27,490
	NI-40x	1,065	8,480	10.39	48.7	27,490
	NI-60	1,136	11,130	10.39	48.7	27,490
	NI-70	1,478	14,960	10.39	48.7	27,490
	NI-80	1,570	15,740	10.39	48.7	27,490
	NI-90	1,725	19,800	13.52	48.7	27,490
	NI-90x	1,765	21,345	14.43	48.7	27,490
356 (14)	NI-40	1,383	9,630	12.15	48.7	32,380
	NI-40x	1,550	10,215	12.15	48.7	32,380
	NI-60	1,676	13,405	12.15	48.7	32,380
	NI-70	2,149	18,015	12.15	48.7	32,380
	NI-80	2,302	18,955	12.15	48.7	32,380
	NI-90	2,517	23,835	14.92	48.7	32,380
	NI-90x	2,612	25,740	15.52	48.7	32,380
406 (16)	NI-40	1,885	11,160	13.83	48.7	37,010
	NI-40x	2,106	11,840	13.83	48.7	37,010
	NI-60	2,293	15,550	13.83	48.7	37,010
	NI-70	2,913	20,895	13.83	48.7	37,010
	NI-80	3,134	21,975	13.83	48.7	37,010
	NI-90	3,406	27,645	16.36	48.7	37,010
	NI-90x	3,573	29,540	16.36	48.7	37,010
457 (18)	NI-60	2,924	17,590	14.04	45.0	41,640
	NI-80x	4,015	24,780	16.57	31.0	41,640
508 (20)	NI-80x	5,082	27,770	17.20	31.0	46,260
559 (22)	NI-80x	6,288	30,770	17.76	31.0	50,890
610 (24)	NI-80x	7,634	33,770	18.26	31.0	55,510

For Imperial: 1 mm = 0.0394 in., 1 N = 0.2248 lbf, 1 kN/m = 5.71 lbf/in.

- (a) All factored resistance values include the resistance factor specified in CSA O86. The tabulated values are for the standard term of load duration ($K_D = 1.0$). All values, except for EI, vertical load resistance, and K, are permitted to be adjusted for other load durations as permitted by the code.
- (b) Bending stiffness (EI) of the I-joint.
- (c) Factored moment resistance (M_r) of the I-joint.
- (d) Factored shear resistance (V_r) of the I-joint.
- (e) Factored uniform vertical load resistance (VLC_r) of the I-joint.
- (f) Coefficient of shear deflection (K). For calculating uniform load and center-point load deflections of the I-joint in a simple-span application, use Equations 1 and 2.

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

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

Where:

- δ = calculated deflection (mm)
- ω = uniform load (kN/mm)
- P = concentrated load (kN)
- ℓ = design span (mm)
- EI = bending stiffness of the I-joint (kN-mm²)
- K = coefficient of shear deflection (kN)

Table 3. Factored Reaction Resistances for Nordic Joist™ Series I-Joists^(a,b,c,d)

Joist Depth, mm (in.)	Joist Series	Intermediate Reaction (kN)				End Reaction (kN)			
		89 mm (3-1/2 in.) Brg. Length		140 mm (5-1/2 in.) Brg. Length		45 mm (1-3/4 in.) Brg. Length		102 mm (4 in.) Brg. Length	
		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
200 (7-7/8)	NI-40x	14.11	14.11	14.11	14.11	6.18	6.18	6.18	6.18
	NI-60	14.11	14.11	14.11	14.11	6.18	6.18	6.18	6.18
	NI-80	14.11	14.11	14.11	14.11	6.18	6.18	6.18	6.18
235 (9-1/4)	NI-20	16.50	16.57	17.62	17.62	7.13	7.13	7.58	7.58
	NI-40x	16.50	16.57	17.80	17.90	7.97	7.97	8.21	8.21
	NI-60	16.50	16.67	17.83	17.90	7.97	7.97	8.21	8.21
	NI-80	16.50	18.04	18.11	18.11	8.21	8.21	8.21	8.21
241 (9-1/2)	NI-20	16.92	17.03	18.08	18.08	7.27	7.27	7.86	7.86
	NI-40	16.92	17.03	18.46	18.57	8.25	8.42	8.42	8.42
	NI-40x	16.92	17.03	18.46	18.57	8.25	8.42	8.42	8.42
	NI-60	16.96	17.13	18.50	18.71	8.25	8.42	8.42	8.42
	NI-70	16.96	18.75	18.85	18.85	8.42	8.42	8.42	8.42
	NI-80	16.96	18.75	18.85	18.85	8.42	8.42	8.42	8.42
286 (11-1/4)	NI-20	19.97	20.15	21.38	21.38	8.35	8.35	9.41	9.41
	NI-40x	19.97	20.15	23.17	23.38	8.78	9.90	9.90	9.90
	NI-60	20.01	20.40	23.24	23.70	8.78	9.90	9.90	9.90
	NI-80	20.01	22.15	23.94	23.94	9.34	9.90	9.90	9.90
302 (11-7/8)	NI-20	21.06	21.27	22.57	22.57	8.74	8.74	9.97	9.97
	NI-40	21.06	21.27	24.85	25.10	8.95	10.39	10.39	10.39
	NI-40x	21.06	21.27	24.85	25.10	8.95	10.39	10.39	10.39
	NI-60	21.10	21.55	24.92	25.45	8.95	10.39	10.39	10.39
	NI-70	21.10	23.38	25.77	25.77	9.48	10.39	10.39	10.39
	NI-80	21.10	23.38	25.77	25.77	9.48	10.39	10.39	10.39
	NI-90	23.55	23.55	25.77	25.77	9.83	10.39	13.23	13.52
	NI-90x	29.28	29.28	29.28	29.28	12.39	14.43	13.23	14.43
356 (14)	NI-40	21.98	22.19	24.78	25.03	9.30	11.87	10.88	12.15
	NI-40x	21.98	22.19	24.78	25.03	9.30	11.87	10.88	12.15
	NI-60	22.05	22.89	24.85	26.64	9.44	11.87	10.88	12.15
	NI-70	23.38	25.56	26.82	28.61	10.22	11.87	10.88	12.15
	NI-80	23.38	25.56	26.82	28.61	10.22	11.87	10.88	12.15
	NI-90	23.55	25.56	26.82	28.61	10.22	11.87	13.23	14.92
	NI-90x	29.28	29.28	29.28	29.28	12.64	15.52	13.23	15.52

(Footnotes on following page)

Table 3. Factored Reaction Resistances for Nordic Joist™ Series I-Joists^(a,b,c,d) (Continued)

Joist Depth (in.)	Joist Series	Intermediate Reaction (kN)				End Reaction (kN)			
		89 mm (3-1/2 in.) Brg. Length		140 mm (5-1/2 in.) Brg. Length		45 mm (1-3/4 in.) Brg. Length		102 mm (4 in.) Brg. Length	
		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
406 (16)	NI-40	22.85	23.06	24.71	24.96	9.62	13.16	10.88	13.83
	NI-40x	22.85	23.06	24.71	24.96	9.62	13.16	10.88	13.83
	NI-60	22.92	24.15	24.78	27.77	9.90	13.16	10.88	13.83
	NI-70	25.56	27.59	27.80	31.28	10.88	13.16	10.88	13.83
	NI-80	25.56	27.59	27.80	31.28	10.88	13.16	10.88	13.83
	NI-90	25.56	27.59	27.80	31.28	10.88	13.16	13.23	16.36
	NI-90x	29.28	29.28	29.28	29.28	12.85	16.32	13.23	16.36
457 (18)	NI-60	19.66	25.42	22.89	28.89	10.36	14.04	12.99	14.04
	NI-80x	21.87	26.82	23.03	31.03	9.13	13.34	12.99	16.57
508 (20)	NI-80x	22.40	28.93	23.94	32.12	9.27	14.36	13.34	17.20
559 (22)	NI-80x	22.92	31.07	24.82	33.21	9.41	15.41	13.69	17.76
610 (24)	NI-80x	23.45	33.17	25.73	34.30	9.55	16.43	14.04	18.25

For Imperial: 1 mm = 0.0394 in., 1 N = 0.2248 lbf

- (a) The tabulated end and intermediate reaction values shall not be greater than the bearing capacity of the flanges based on the specified compressive strength perpendicular to grain of 5.3 MPa when determined in accordance with CSA O86. Consult with the manufacturer for the factored compressive strength perpendicular to the grain of the flange for bearing design.
- (b) Factored reaction resistance is for the standard term of load duration ($K_D = 1.0$) and shall be permitted to be adjusted for other load durations as permitted by the code.
- (c) Factored reaction resistance shall be permitted to be increased over that tabulated for the minimum bearing length by linear interpolation of the reaction resistance 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 4 and the recommendations provided by the manufacturer.

Table 4. Minimum Dimensions for Web Stiffeners^(a)

Joist Series	Web Stiffeners		Flange width, b_f , mm (in.)
	Thickness, mm (in.)	Width, mm (in.)	
NI-20	25 (1)	59 (2-5/16)	64 (2-1/2)
NI-40	25 (1)	59 (2-5/16)	64 (2-1/2)
NI-40x	25 (1)	59 (2-5/16)	64 (2-1/2)
NI-60	25 (1)	59 (2-5/16)	64 (2-1/2)
NI-70	38 (1-1/2)	59 (2-5/16)	89 (3-1/2)
NI-80	38 (1-1/2)	59 (2-5/16)	89 (3-1/2)
NI-80x	38 (1-1/2)	59 (2-5/16)	89 (3-1/2)
NI-90	38 (1-1/2)	59 (2-5/16)	89 (3-1/2)
NI-90x	38 (1-1/2)	59 (2-5/16)	89 (3-1/2)

^(a) Web stiffener length is 3 mm (1/8 inch) to 6 mm (1/4 inch) less than the clear distance between flanges. Stiffeners 25 mm (1-inch) thick are wood structural panels and stiffeners 38 mm (1-1/2-inch) thick are SPF lumber (relative density of 0.42) or denser lumber.

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