



## Evaluation Report CCMC 13032-R Nordic I-Joist Series

<b>MASTERFORMAT:</b>	06 17 33.01
<b>Evaluation issued:</b>	2001-10-29
<b>Re-evaluated:</b>	2014-02-26
<b>Re-evaluation due:</b>	2016-10-29

### 1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Nordic I-Joist Series”, when used as joists in floor and roof applications in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code 2010:

- Clause 1.2.1.1.(1)(a), Division A, using the following acceptable solutions from Division B:
  - Sentence 4.3.1.1.(1), CAN/CSA-O86-09, Engineering Design in Wood (i.e., Code-specified I-joist qualification)
- Clause 1.2.1.1.(1)(b), Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
  - Sentence 9.23.4.2.(2), Spans for Joists, Rafters and Beams (i.e., alternative floor joist solution)

This opinion is based on CCMC's evaluation of the technical evidence in Section 4 provided by the Report Holder.

Ruling No. 06-05-149 (13032-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 2006-03-02 (revised on 2009-08-20) pursuant to s.29 of the Building Code Act, 1992 (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

### 2. Description

The products are a series of prefabricated wood I-joists consisting of two continuous proprietary grade spruce-pine-fir (S-P-F) flanges glued to a 9.5-mm or 11.1-mm-thick oriented strandboard (OSB) web. The flange sizes and grades are listed in Table 2.1 below.

The web-flange connection is made by inserting the profiled OSB web into a tapered groove in the flange's centre. The OSB web material is manufactured in 2 454-mm lengths and end-jointed by glueing a full thickness vee or butt joint.

The web/web joint, flange/web joint and the flange finger joints are bonded with a polyurethane adhesive (see CCMC 13512-L, CCMC 13513-L and CCMC 13591-L).

APA – The Engineered Wood Association (APA EWS trademark) conducts regular audits of the manufacturing plant and the quality assurance program as part of the product certification.

**Table 2.1 “Nordic I-joist” Flange Sizes and Grades**

Nordic I-Joist	Depth (mm)	Grade	Flange Size (mm)	Web Thickness (mm)
NI-20	235-302	S-P-F No. 2	38 x 63.5	9.5
NI-40	241-406	MSR 1650f-1.5E	38 x 63.5	9.5

**Table 2.1 “Nordic I-joist” Flange Sizes and Grades (cont.)**

Nordic I-Joist	Depth (mm)	Grade	Flange Size (mm)	Web Thickness (mm)
NI-40x	200-406	Enhanced <sup>1</sup> 1650f-1.5E	38 x 63.5	9.5
NI-60	200-457	MSR 2100f-1.8E	38 x 63.5	9.5
NI-70	200-457	MSR 1950f-1.7E	38 x 89	9.5
NI-80	200-406	MSR 2100f-1.8E	38 x 89	9.5
NI-80x	457-610	MSR 2100f-1.8E	38 x 89	11.1
NI-90	302-406	MSR 2400f-2.0E	38 x 89	11.1
NI-90x	302-406	Glue laminated wood <sup>2</sup>	51 x 89	11.1

**Notes to Table 2.1:**

- <sup>1</sup> “Enhanced” flange material refers to a proprietary grade conforming to additional grade rules specified within the quality control manufacturing program.
- <sup>2</sup> This flange material is a proprietary grade flange of face-glued lumber elements (3-19 mm x 89 mm) manufactured by Nordic Engineered Wood as a qualified glulam manufacturer.

**3. Conditions and Limitations**

CCMC's compliance opinion in Section 1 is bound by the “Nordic I-Joist Series” being used in accordance with the conditions and limitations set out below.

- The product series are intended for structural applications, such as floor, ceiling or roof joists, and are intended for dry service use<sup>1</sup> applications only.
- The following pre-engineering information has been provided to CCMC by Nordic Engineered Wood to demonstrate compliance with Part 9 of the NBC 2010 for acceptance by the local authority having jurisdiction (AHJ):

**i. Nordic Engineered Wood’s Pre-engineered Floor Span Charts**

When the products are used to support uniform loads only, the installation must be in accordance with the span tables (including vibration criteria<sup>2</sup>) found in the specifier’s guides, in limit states design for Canada, entitled:

1. “Nordic Joist Installation Guide for Residential Floors,” dated September 2013;
2. “Nordic Joist Residential Design/Construction Guide,” dated January 2014;
3. “Nordic Joist 9-1/4" and 11-1/4" NI-40x I-Joists,” dated September 2013;
4. “Nordic Joist Residential I-Joists,” dated September 2013;
5. “Nordic Joist Light-Commercial I-Joists,” dated September 2013; and
6. “Nordic Joist, Roof Details,” dated September 2013.

The products must be installed in accordance with Nordic Engineered Wood’s installation guidelines noted in these documents for applications falling within the scope of the documents. Applications outside the scope of these installation guidelines shall require engineering on a case-by-case basis.

**ii. Nordic Engineered Wood’s Pre-engineered Installation Details**

The products must be installed in accordance with Nordic Engineered Wood’s pre-engineered details outlined in the documents specified in 3(i) above, where the following details are not exceeded:

- rim board maximum vertical load;
- squash blocks maximum vertical load;
- blocking panel maximum vertical load;

- web stiffeners requirements;
- stair opening header;
- loadbearing cantilever load table;
- cantilever balcony;
- web hole tables;
- roof joist details; and
- roof uniform load tables.

### iii. Engineering Required

For structural applications beyond the scope/limitations of the above-referenced Nordic Engineered Wood’s publications or when required by the AHJ, the drawings or related documents must bear the authorized seal of a professional engineer skilled in wood design and licensed to practice under the appropriate provincial or territorial legislation.

Installations beyond the scope/limitations of 3(i) and 3(ii) imply, but are not limited to, the following:

- higher loads/longer spans than the manufacturer’s pre-engineered details;
- concentrated loads;
- offset bearing walls;
- areas of high wind or high seismicity;
- stair openings;
- design of supporting wall studs/beams when the total load exceeds the NBC 2010 pre-engineered floor/roof joist tables; and
- design of supporting foundation footings when the total load exceeds the NBC 2010 pre-engineered floor/roof joist tables.

The engineer must design in accordance with CAN/CSA-O86-09 and may use, as a guide, the *Engineering Guide for Wood-Frame Construction*, published by the Canadian Wood Council.

### iv. Engineering Support Provided by Manufacturer

Nordic Engineered Wood does provide engineering support in conjunction with Nordic Engineered Wood product support. Nordic Engineered Wood offers the following support contact information:

Telephone: (514) 871-8526

E-mail: [info@nordicewp.com](mailto:info@nordicewp.com)

- These products must be identified with the phrase “CCMC 13032-R” along the side of the flange. This CCMC number is only valid when it appears in conjunction with the APA EWS certification mark.
- Damaged or defective joists must not be used, unless repaired in accordance with written instructions from the manufacturer.

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1 All lumber, wood-based panels and proprietary engineered wood products are intended for “dry service conditions.” “Dry service” is defined as the in-service environment under which the equilibrium moisture content (MC) of lumber is 15% or less over a year and does not exceed 19% at any time. Wood contained within the interior of dry, heated or unheated buildings has generally been found to have a MC between 6% and 14% according to season and location. During construction, all wood-based products should be protected from the weather to ensure that the 19% MC is not exceeded in accordance with the NBC 2010, Division B, Article 9.3.2.5.

2 In cases where concrete topping is applied or bridging/blocking is used and joists are installed at the maximum spans, the current vibration criteria may not address all occupant performance expectations. Nordic Engineered Wood should therefore be consulted for span adjustments, if necessary, in these types of installations.

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## 4. Technical Evidence

The Report Holder has submitted technical documentation for CCMC’s evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

## 4.1 General

### 4.1.1 Design Values

Table 4.1.1 Product Engineering Properties<sup>1</sup>

Joist Depth (mm)	Joist Series	$EI^2$ ( $\times 10^6$ kN·mm <sup>2</sup> )	$M_R^3$ (N·m)	$V_R^4$ (N)	$K^5$ ( $\times 10^3$ kN)	Factored Uniform Vertical Load Resistance <sup>6</sup> (kN/m)
235	NI-20	396	5 660	7 580	21.40	48.7
	NI-40x	568	6 335	8 210	21.40	
	NI-60	623	8 300	8 210	21.40	
	NI-80	872	11 760	8 210	21.40	
241	NI-20	416	5 840	7 860	21.97	48.7
	NI-40	554	6 165	8 430	21.97	
	NI-40x	626	6 540	8 430	21.97	
	NI-60	663	8 590	8 430	21.97	
	NI-70	872	11 545	8 430	21.97	
	NI-80	930	12 145	8 430	21.97	
286	NI-20	637	7 115	9 410	26.02	48.7
	NI-40x	898	7 970	9 900	26.02	
	NI-60	996	10 440	9 900	26.02	
	NI-80	1 389	14 795	9 900	26.02	
302	NI-20	726	7 565	9 970	27.49	48.7
	NI-40	947	7 995	10 390	27.49	
	NI-40x	1 065	8 480	10 390	27.49	
	NI-60	1 136	11 130	10 390	27.49	
	NI-70	1 478	14 960	10 390	27.49	
	NI-80	1 570	15 740	10 390	27.49	
	NI-90	1 725	19 800	13 520	27.49	
	NI-90x	1 765	21 345	14 430	27.49	

**Table 4.1.1 Product Engineering Properties<sup>1</sup> (cont.)**

Joist Depth (mm)	Joist Series	$EI^2$ ( $\times 10^6$ kN·mm <sup>2</sup> )	$M_r^3$ (N·m)	$V_r^4$ (N)	$K^5$ ( $\times 10^3$ kN)	Factored Uniform Vertical Load Resistance <sup>6</sup> (kN/m)
356	NI-40	1 383	9 630	12 150	32.38	48.7
	NI-40x	1 550	10 215	12 150	32.38	
	NI-60	1 676	13 405	12 150	32.38	
	NI-70	2 149	18 015	12 150	32.38	
	NI-80	2 302	18 955	12 150	32.38	
	NI-90	2 517	23 835	14 920	32.38	
	NI-90x	2 612	25 740	15 520	32.38	
406	NI-40	1 885	11 160	13 830	37.01	48.7
	NI-40x	2 106	11 840	13 830	37.01	
	NI-60	2 293	15 550	13 830	37.01	
	NI-70	2 913	20 895	13 830	37.01	
	NI-80	3 134	21 975	13 830	37.01	
	NI-90	3 406	27 645	16 360	37.01	
	NI-90x	3 573	29 540	16 360	37.01	
457	NI-60	2 924	17 590	14 040	41.64	45.0
	NI-80x	4 015	24 780	16 570	41.64	31.0
508	NI-80x	5 082	27 770	17 200	46.26	31.0
559	NI-80x	6 288	30 770	17 760	50.89	31.0
610	NI-80x	7 634	33 770	18 260	55.51	31.0

**Notes to Table 4.1.1:**

- 1 The tabulated values are for the standard term of load duration ( $K_D = 1.0$ ). All values, except for EI and K, shall be permitted to be adjusted for other load durations as permitted by the NBC.
- 2 Bending stiffness (EI) of the I-joists
- 3 Factored moment resistance ( $M_r$ ) of the I-joists, which cannot be increased by any Code-allowed system effect factor
- 4 Factored shear resistance ( $V_r$ ) of the I-joists

- 5 Coefficient of shear deflection (K). For calculating uniform load centre-span deflection of the I-joist in a simple-span application, use the following equation:

$$\text{deflection} = \frac{5wL^4}{384EI} + \frac{wL^2}{K}$$

where w = load (kN/mm), L = span (mm), EI and K are taken from Table 4.1.1

- 6 Factored uniform vertical load resistance of the I-joist when used as blocking (i.e., squash blocks).

**Table 4.1.2 Product Factored Reaction Resistances** [1](#) [2](#) [3](#) [4](#)

Joist Depth (mm)	Joist Series	Intermediate Reaction (N)				End Reaction (N)			
		89-mm Brg. Length		140-mm Brg. Length		45-mm Brg. Length		102-mm Brg. Length	
		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
235	NI-20	16 500	16 570	17 620	17 620	7 130	7 130	7 580	7 580
	NI-40x	16 500	16 570	17 800	17 900	7 970	7 970	8 210	8 210
	NI-60	16 500	16 670	17 830	17 900	7 970	7 970	8 210	8 210
	NI-80	16 500	18 040	18 110	18 110	8 210	8 210	8 210	8 210
241	NI-20	16 920	17 030	18 080	18 080	7 270	7 270	7 860	7 860
	NI-40	16 920	17 030	18 460	18 570	8 250	8 420	8 420	8 420
	NI-40x	16 920	17 030	18 460	18 570	8 250	8 420	8 420	8 420
	NI-60	16 960	17 130	18 500	18 710	8 250	8 420	8 420	8 420
	NI-70	16 960	18 750	18 850	18 850	8 420	8 420	8 420	8 420
	NI-80	16 960	18 750	18 850	18 850	8 420	8 420	8 420	8 420
286	NI-20	19 970	20 150	21 380	21 380	8 350	8 350	9 410	9 410
	NI-40x	19 970	20 150	23 170	23 380	8 780	9 900	9 900	9 900
	NI-60	20 010	20 400	23 240	23 700	8 780	9 900	9 900	9 900
	NI-80	20 010	22 150	23 940	23 940	9 340	9 900	9 900	9 900

**Table 4.1.2 Product Factored Reaction Resistances [1](#) [2](#) [3](#) [4](#) (cont.)**

Joist Depth (mm)	Joist Series	Intermediate Reaction (N)				End Reaction (N)			
		89-mm Brg. Length		140-mm Brg. Length		45-mm Brg. Length		102-mm Brg. Length	
		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
302	NI-20	21 060	21 270	22 570	22 570	8 740	8 740	9 970	9 970
	NI-40	21 060	21 270	24 850	25 100	8 950	10 390	10 390	10 390
	NI-40x	21 060	21 270	24 850	25 100	8 950	10 390	10 390	10 390
	NI-60	21 100	21 550	24 920	25 450	8 950	10 390	10 390	10 390
	NI-70	21 100	23 380	25 770	25 770	9 480	10 390	10 390	10 390
	NI-80	21 100	23 380	25 770	25 770	9 480	10 390	10 390	10 390
	NI-90	23 550	23 550	25 770	25 770	9 830	10 390	13 230	13 520
	NI-90x	29 280	29 280	29 280	29 280	12 390	14 430	13 230	14 430
356	NI-40	21 980	22 190	24 780	25 030	9 300	11 870	10 880	12 150
	NI-40x	21 980	22 190	24 780	25 030	9 300	11 870	10 880	12 150
	NI-60	22 050	22 890	24 850	26 640	9 440	11 870	10 880	12 150
	NI-70	23 380	25 560	26 820	28 610	10 220	11 870	10 880	12 150
	NI-80	23 380	25 560	26 820	28 610	10 220	11 870	10 880	12 150
	NI-90	23 550	25 560	26 820	28 610	10 220	11 870	13 230	14 920
	NI-90x	29 280	29 280	29 280	29 280	12 640	15 520	13 230	15 520
406	NI-40	22 850	23 060	24 710	24 960	9 620	13 160	10 880	13 830
	NI-40x	22 850	23 060	24 710	24 960	9 620	13 160	10 880	13 830
	NI-60	22 920	24 150	24 780	27 770	9 900	13 160	10 880	13 830
	NI-70	25 560	27 590	27 800	31 280	10 880	13 160	10 880	13 830
	NI-80	25 560	27 590	27 800	31 280	10 880	13 160	10 880	13 830
	NI-90	25 560	27 590	27 800	31 280	10 880	13 160	13 230	16 360
	NI-90x	29 280	29 280	29 280	29 280	12 850	16 320	13 230	16 360
457	NI-60	19 660	25 420	22 890	28 890	10 360	14 040	12 990	14 040
	NI-80x	21 870	26 820	23 030	31 030	9 130	13 340	12 990	16 570

**Table 4.1.2 Product Factored Reaction Resistances <sup>1 2 3 4</sup> (cont.)**

Joist Depth (mm)	Joist Series	Intermediate Reaction (N)				End Reaction (N)			
		89-mm Brg. Length		140-mm Brg. Length		45-mm Brg. Length		102-mm Brg. Length	
		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners		With Brg. Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
508	NI-80x	22 400	28 930	23 940	32 120	9 270	14 360	13 340	17 200
559	NI-80x	22 920	31 070	24 820	33 210	9 410	15 410	13 690	17 760
610	NI-80x	23 450	33 170	25 730	34 300	9 550	16 430	14 040	18 250

**Notes to Table 4.1.2:**

- 1 The tabulated end and intermediate reaction values must 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 CAN/CSA-O86. Consult with the manufacturer for the factored compressive strength perpendicular to the grain of the flange for bearing design.
- 2 The tabulated values are for the standard term of load duration ( $K_D = 1.0$ ) and are permitted to be adjusted for other load durations as permitted by the NBC.
- 3 Factored reaction resistance is 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.
- 4 The manufacturer must be consulted for the design of web stiffeners, where web stiffeners are required.

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**Date modified:**  
2014-03-03

## APPENDIX A

The characteristic values meeting ASTM D 5055-08a, “Standard Specification for Establishing and Monitoring Structural Capacities of Pre-fabricated Wood I-Joists,” as specified in CAN/CSA-O86-09, are summarized below. The manufacturer’s published pre-engineered joist spans were designed in accordance with CAN/CSA-O86-09.

**Table A1. Additional Product Testing Information**

Property	Test Information
Shear capacity	The shear capacity of the specimens was established by combining data in accordance with ASTM D 5055-04. Data from quality control (QC) tests were used to establish the applicable coefficient of variation, $CV_w$ , and the reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strength.
Moment capacity	The moment capacity qualification was carried out using the analytical method based on the characteristics of the flange material, with confirmatory testing in accordance with ASTM D 5055-04. Data from QC tests were used to establish the applicable coefficient of variation, $CV_w$ , and the reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strength.
Stiffness	<p>An appropriate test program was used to confirm the stiffness capacity. The following formula was used to predict mid-span deflection:</p> $\text{deflection} = \frac{5wL^4}{384EI} + \frac{wL^2}{K}$ <p>where <math>w</math> = load (kN/mm), <math>L</math> = span (mm), <math>EI</math> and <math>K</math> are taken from Tables 4.1.1.1 and 4.1.1.2</p>
End joints	End joints were qualified as part of the flange tension qualification. The flanges are in-plant finger-joined, and regular tension testing is conducted.
Creep	Specimens were tested for creep performance in accordance with ASTM D 5055-04. The specimens recovered more than 90% of the basic dead load deflection.
Bearing length	End and intermediate reactions were tested and calculated in accordance with ASTM D 5055-12 and CAN/CSA-O86-09 where the applicable coefficient of variation, $CV_w$ , and the reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strength.
Adhesive qualification	The web/web joint, flange/web joint and flange finger joints are bonded with a polyurethane adhesive (see CCMC 13512-L, CCMC 13513-L and CCMC 13591-L).
Web stock	The web stock complies with CAN/CSA-O325.0-92, “Construction Sheathing.”