



Evaluation Report CCMC 13535-R Nascor NJ10-12, NJH10-16, and NJM10-18 Series I-Joists

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Nascor NJ10-12, NJH10-16, and NJM10-18 Series I-Joists,” when used as joists in floor and roof applications in accordance with the conditions and limitations stated in Section 3 of this Report, comply with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1.(1)(a) of Division A, using the following acceptable solutions from Division B:
 - Sentence 4.3.1.1.(1), Design Basis for Wood (CSA O86-14, “Engineering Design in Wood,” for I-joist qualification)
- Clause 1.2.1.1.(1)(b) of 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

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

Ruling No. 10-20-257 (13535-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 2010-12-30 (revised 2017-03-22) 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

“NJ” series joists are pre-fabricated wood I-joists consisting of two 38-mm × 64-mm Spruce – Pine – Fir (S – P – F) lumber flanges. The flanges are graded in accordance with the Nascor I-Joist Quality Assurance Manual and glued edgewise to a 9.5-mm-thick oriented strand board (OSB) web. “NJ” series joists are available in depths of 241 mm and 302 mm.

“NJH” series joists are pre-fabricated wood I-joists consisting of two 38-mm × 64-mm S – P – F lumber flanges. The flanges are graded in accordance with the Nascor I-Joist Quality Assurance Manual and glued flatwise to a 9.5-mm-thick OSB web. “NJH” series joists are available in depths of 241 mm, 302 mm, 356 mm, and 406 mm.

“NJM” series joists (produced only at the AcuTruss facility) are pre-fabricated I-joists consisting of two 38-mm × 89-mm S – P – F lumber flanges. The flanges are graded in accordance with the Nascor I-Joist Quality Assurance Manual and glued flatwise to a 9.5-mm-thick OSB web. “NJM” series joists are available in depths of 241 mm, 302 mm, 356 mm, 406 mm, and 457 mm.

The OSB web material is installed with the wafer orientation parallel to the length of the joist. The web segments, web/flange, and flange fingerjoints are bonded with the following phenol-resorcinol adhesives:

- (i) Cascophen® LT-5210Q resin with Cascoset® FM-7400 hardener (see CCMC 13054-L), used at the KOTT Inc. plant in Ottawa, ON and
- (ii) 4001/5830E PRF, which meets the requirements of CSA O112.7, “Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing),” and is used at the AcuTruss plant in Kelowna, BC.

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the "NJ10-12, NJH10-16, and NJM10-18 Series I-Joists" being used in accordance with the conditions and limitations set out below.

- The products are intended for use in structural applications, such as floor, ceiling or roof joists, and are intended for dry service use⁽¹⁾ applications only.
- The following pre-engineering has been provided to CCMC by Nascor Systems to demonstrate compliance with Part 9, Housing and Small Buildings, of the NBC 2015 for acceptance by the local authority having jurisdiction (AHJ):

i. Pre-engineered Floor Span Charts

The pre-engineered tables in the publication outlined below have been provided to CCMC by the manufacturer to demonstrate compliance with Part 9 of the NBC 2015 for acceptance by the local AHJ.

When the products are used to support uniform loads only, the installation must be in accordance with the span tables (including vibration criteria⁽²⁾) found in the Nascor Systems "Specifier Guide NJ, NJH, NJM Series I-Joists, Canadian version", October 2018. Applications outside the scope of these installation guidelines require engineering on a case-by-case basis.

ii. Nascor Systems Pre-engineered Installation Details

Nascor Systems' pre-engineered details within the documents outlined in (i) above are limited in scope to building designs where the anticipated loads on the following structural details are not exceeded:

- web hole table (pages 12-15);
- "NJ10-12" rim joist (page 7);
- cantilevers (pages 16-19);
- floor installation details (pages 7-8); and
- multiple-ply I-joists, side loads (page 9).

iii. Engineering Required

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

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

- higher loads and/or longer spans than the manufacturer's pre-engineered details;
- concentrated loads;
- offset bearing walls;
- areas of high wind and/or high seismicity;
- stair openings not covered in the Specifier Guides;
- roof joists;
- design of supporting wall studs/beams when total load exceeds the NBC 2015 pre-engineered lumber floor/roof joist span tables;
- design of supporting foundation footings when total load exceeds the NBC 2015 pre-engineered lumber floor/roof joist tables; and
- fire resistance (see applicable fire-resistance assembly listings for the specific joist and adhesive used).

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

The factored resistance and engineering properties for the products must not exceed the values set forth in Tables 4.1.1 and 4.1.2.

iv. Engineering Support Provided by Manufacturer

Nascor Systems provides engineering support and must be consulted in the use of "Nascor NJ10-12, NJH10-16, and NJM10-18 Series I-Joists." Nascor Systems' technical services may be reached at: 1-800-668-2365.

Damaged or defective joists must not be used, unless repaired in accordance with written instructions from the manufacturer.

- "Nascor NJ10-12, NJH10-16, and NJM10-18 Series I-Joists" must be identified with the phrase "CCMC 13535-R" along the side of the product. This CCMC number is only valid when it appears in conjunction with the WHI certification mark of Intertek Testing

Notes:

- (1) All lumber, wood-based panels and proprietary engineered wood products are intended for dry service conditions. “Dry service” is the in-service environment in which the average 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%, depending on the 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 Article 9.3.2.5., Moisture Content, of Division B of the NBC 2015.
- (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. Nascor Systems should therefore be consulted for span adjustments, if necessary, in these types of installations.

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 Design Requirements

Table 4.1.1 Engineering Properties of “NJ10-12, NJH10-16, and NJM10-18 Series I-Joists”⁽¹⁾⁽²⁾⁽³⁾

Joist Type	Depth (mm)	Weight (N/m)	Moment Resistance (N·m)	Shear Resistance (N)	Bending Stiffness, EI × 10 ⁶ (kN·mm ²)	Shear Deflection Coefficient, K (× 10 ⁶ N)
NJ10	241	32.0	4 980	6 850	402	20.00
NJ12	302	35.0	6 110	7 560	717	25.08
NJH10	241	33.5	5 190	7 030	519	20.00
NJH12	302	39.4	7 310	8 050	884	25.08
NJH14	356	44.0	10 740	9 520	1 234	29.57
NJH16	406	48.0	12 760	10 630	1 676	33.80
NJM10	241	39.4	10 655	7 025	861	20.06
NJM12	302	42.3	13 815	8 050	1 484	25.09
NJM14	356	46.7	16 635	9 515	2 167	29.58
NJM16	406	49.6	19 285	10 630	2 933	33.81
NJM18	457	52.5	21 940	11 250	3 825	38.03

Table 4.1.2 Additional Engineering Properties of “NJ10-12, NJH10-16 and NJM10-18 Series I-Joists” with No Web Stiffeners⁽¹⁾⁽²⁾⁽³⁾

Joist Type	Depth (mm)	Factored End Reaction (N)		Factored Intermediate Reaction (N)	
		38-mm Bearing Length	63-mm Bearing Length	89-mm Bearing Length	140-mm Bearing Length
NJ10	241	6 850	6 850	13 700	13 700
NJ12	302	7 560	7 560	15 120	15 120
NJH10	241	7 006	7 030	14 060	14 060
NJH12	302	7 006	7 718	16 080	16 100
NJH14	356	7 006	7 718	16 659	18 304
NJH16	406	7 006	7 718	17 192	18 949
NJM10	241	7 006	7 006	14 034	14 034
NJM12	302	7 606	7 784	15 391	15 991
NJM14	356	8 140	8 474	16 636	17 748
NJM16	406	8 630	9 141	17 793	19 394
NJM18	457	9 119	9 808	18 949	21 062

Notes to Tables 4.1.1 and 4.1.2:

- (1) Design values were developed in accordance with CSA O86.
 - (2) All factored resistance values include the resistance factor and the reliability normalization factor (K_r).
 - (3) Additional engineering data and load/span tables are available from the manufacturer.
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Appendix A

Summarized below are the characteristic values obtained from testing in accordance with ASTM D 5055-04 and updated reaction values in accordance with ASTM D 5055-08a, “Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists,” as specified in CSA O86-09. The manufacturer’s published pre-engineered joist spans were designed in accordance with CSA O86-14.

Table A1. Additional Testing Information for “Nascor NJ10-12, NJH10-16, and NJM10-18 Series I-Joists”

Property	Test Information
Moment capacity	The moment capacity qualification was carried out using the empirical method in accordance with ASTM D 5055-04 for NJ and NJH joists. At each plant, a minimum of 28 specimens of each joist depth are tested on a quarterly basis to verify the actual capacity versus the design capacity.
	The moment capacity qualification testing was carried out using the analytical method in accordance with ASTM D 5055-08a for NJM joists. At the Kelowna plant, 10 specimens at each of the extremes of joist depth were tested for moment capacity confirmation as per Section 6.4.2 of ASTM D 5055-08a.
	Qualification tests were used to establish the applicable coefficient of variation, CV_w . The reliability normalization factor from Table 13.2.3.2 of CSA O86 was used to determine the specified strength.
Shear capacity	The shear capacity was established by computing the shear capacity for each depth separately as per ASTM D 5055-04 for NJ and NJH joists, and ASTM D 5055-08a for NJM joists. Qualification tests were used to establish the applicable coefficient of variation, CV_w . The reliability normalization factor from Table 13.2.3.2 of CSA O86 was used to determine the specified strength.
Stiffness	Stiffness capacity was tested in accordance with Section 6.5.2 of ASTM D 5055-04 for NJ and NJH joists, and ASTM D 5055-08a for NJM joists. The following formula was used to predict mid-span deflection: $\Delta_{deflection} = \frac{5wL^4}{384EI} + \frac{wL^2}{K}$ <p>where L = clear span (mm) w = load (kN/mm) EI (kN·mm²) and K are taken from Table 4.1.1.</p> Values are available from the manufacturer’s literature.
Creep	Two joist specimens from each joist series were tested for creep performance, as per ASTM D 5055-04 for NJ and NJH joists, and ASTM D 5055-08a for NJM joists. The specimens were loaded to 1.5 times the maximum resistive moment (design) and the average deflection recovery had to exceed 90% of the basic dead-load deflection. The criteria were met by the tested specimens.
Elastic Properties	Elastic properties of the joist flanges are those of S – P – F #2 lumber (or better graded lumber). Fingerjoined lumber has been qualified through tension testing of 60 specimens and verification bending testing of 56 specimens. The fingerjoined flange lumber design value is maintained through ongoing proof tension testing. The manufacturing of the fingerjoint meets NLGA SPS-1 standards and is verified by the certification agency.
Bearing length	Qualification tests were conducted in accordance with ASTM D 5055-08a on 10 specimens of each depth without stiffeners, and 10 specimens of the extreme depths at the specified bearing lengths for all joist series. The span charts referred to in Section 3(i) are for joists without web stiffeners. Similar qualification was conducted for intermediate bearing; however, the span charts referred to in Section 3(i) are for simple span applications only.
Vibration criteria qualification	Revised spans were prepared to demonstrate compliance to the CCMC vibration criteria. In addition, since conventional cross bridging is not recommended by the I-joist industry, additional testing was conducted to demonstrate no adverse effects on the bottom flange/web joint for only the “NJ10-12 Series I-Joists” products.
Phenol resorcinol formaldehyde (PRF) adhesives	The PRF adhesive Cascophen®LT-5210Q with Cascoset® FM 7400 (see CCMC 13054-L) is used by Nascor Systems KOTT Inc. Company in Ottawa, ON. The PRF adhesive 4001/5830E PRF that is produced by Momentive and complies with CSA-O112.7 is used by AcuTruss in Kelowna, BC.

Note to Table A1:

- (1) Design values were developed in accordance with the referenced standards found herein. The requirements met have not changed in the current editions of the standards referenced in CSA O86-14.