



**National Research
Council Canada**

**Conseil national
de recherches Canada**

Institute for
Research in
Construction

Institut de
recherche en
construction

CCMC 12564-R

CCMC

*EVALUATION
REPORT*

DIVISION 06171

Issued 1994-03-16

Re-evaluated 2007-01-25

Re-evaluation due 2009-03-16

NJ10-12, NJH10-16 and NJU10-18 Series I-Joists

Nascor Ltd.
1212-34 Avenue SE
Calgary, Alberta
T2G 1V7

Tel.: (403) 243-8919
Fax: (403) 243-3417

Plants: NJ10, NJ12, NJH10-16 and
NJU10-18
Nascor Ltd.
Calgary, Alberta

Plants: NJ10, NJ12 and NJH 10-16
(cont'd) Nascor Systems
Kott Lumber Company
Nepean, Ontario

NJ10-12, NJH10-16
All-Fab Building Components
Stony Mountain, Manitoba

NJ10, NJ12 and NJH10-14
Nascor Plus (Kott #2)
Boisbriand, Quebec

NJ10, NJ12 and NJH10-16
Acu Joists
Vernon, British Columbia

This Report is provided without representation, warranty, or guarantee of any kind, expressed or implied, and the National Research Council of Canada (NRC) provides no endorsement for any evaluated material, product, system or service described herein.

NRC has evaluated the material, product, system or service described herein only for those characteristics stated herein. The information and opinions in this Report are directed to those who have the appropriate degree of experience to use and apply its contents.

NRC accepts no responsibility whatsoever arising in any way from any and all use or reliance on the information contained in this Report. NRC is not undertaking to render professional or other services for or on behalf of any person or entity nor to perform any duty owed by any person or entity to another person or entity.

1. Purpose of Evaluation

The manufacturer sought confirmation from the Canadian Construction Materials Centre (CCMC) that Nascor Ltd.'s "NJ10-12, NJH10-16 and NJU10-18 Series I-Joists" manufactured at the above-mentioned plants comply with the intent of

the National Building Code of Canada (NBC) 1995.

2. *Opinion*

Test results and assessments provided by the manufacturer show that “NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” comply with CCMC’s Technical Guide for Prefabricated Wood I-Joists, MasterFormat number 06171, dated 02-09-12, and with CCMC’s vibration criteria. When used in accordance with the limitations and conditions stated in this report, “NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” provide a level of performance equivalent to that required in:

- NBC 1995, Sections 4.1. and 4.3., and Part 9.

Web material complies with:

- CAN/CSA-O325.0-92, “Construction Sheathing,” Exposure 1.

Adhesives used in the joists comply with:

- CSA O112.7-M1977, “Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing).”

For “NJ10 and NJ12” joists manufactured at the Nascor Systems, Nepean, ON plant, adhesives used comply with:

- CCMC’s Technical Guide for Polymer Isocyanate Adhesive for Wood-Based Products, MasterFormat number 06093, dated 97-04-14 (see CCMC # 13052-R).

For “NJ10-12 and NJH10-16” series joists manufactured at the All-Fab Building Components, Stony Mountain, MB plant, adhesives used comply with:

- CCMC’s Technical Guide for Structural Wood Adhesives (Dry Service Use), MasterFormat number 06091.1, dated 06-06-22 (see CCMC # 13267-R).

Ruling No. 05-09-133 (12564-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 13 May, 2005 pursuant to s.29 of the Building Code Act, 1992 (see Ruling for terms and conditions).

Canada Mortgage and Housing Corporation permits the use of this product in construction financed or insured under the National Housing Act.

3. *Description*

“NJ” series joists are prefabricated wood I-joists consisting of two 38-mm x 64-mm S-P-F lumber flanges graded in accordance with the Nascor Quality Assurance Manual, glued (edgewise) to a 9.5-mm-thick oriented strandboard (OSB) web. “NJ” series joists are available in two depths: 241 mm and 302 mm.

“NJH” series joists are prefabricated wood I-joists consisting of two 38-mm x 64-mm S-P-F lumber flanges graded in accordance with the Nascor Quality Assurance Manual, glued (flatwise) to a 9.5-mm-thick OSB web. “NJH” series joists are available in four depths: 241 mm, 302 mm, 356 mm and 406 mm.

“NJU” series joists are prefabricated wood I-joists consisting of two 38-mm x 89-mm S-P-F lumber flanges graded in accordance with the Nascor Quality Assurance Manual, glued (flatwise) to a 9.5-mm-thick OSB web. “NJH” series joists are available in five depths: 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 are either bonded with a phenol-resorcinol, waterproof adhesive to form a continuous web, or bonded with a polyurethane adhesive at qualified plants.

The third-party certification agency, Intertek ETL Semko, WHI mark, accredited by the Standards Council of Canada, conducts regular audits of the manufacturing plants and of the quality assurance program.

The engineering properties of “NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” are outlined in Table 1.

Table 1. Engineering Properties of “NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” (Limit States Design)⁽¹⁾⁽²⁾⁽³⁾

Joist Type	Depth (mm)	Weight (N/m)	Moment Resistance (N m)	Shear Resistance (N)	EI x 10 ⁶ (kN mm ²)	K (x 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			
NJU10	241	39.5	6 510	7 030	709	20.00			
NJU12	302	42.5	9 020	8 050	1 228	25.08			
NJU14	356	47.0	12 030	9 520	1 797	29.57			
NJU16	406	50.0	14 820	10 630	2 436	33.80			
NJU18	457	52.5	18 050	11 250	3 185	38.02			
Product	Joist Depth (mm)	Factored End Reaction (N)				Factored Intermediate Reaction (N)			
		38-mm Brg. Length		63-mm Brg. Length		89-mm Brg. Length		140-mm Brg. Length	
		Web Stiffeners		Web Stiffeners		Web Stiffeners		Web Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
NJ10	241	5 520	n/a	6 140	n/a	10 010	n/a	11 270	n/a
NJ12	302	5 650	n/a	6 140	n/a	12 630	n/a	13 030	n/a
NJH10	241	7 030	7 030	7 030	7 030	14 100	14 100	14 100	14 100
NJH12	302	6 980	8 050	8 050	8 050	15 210	16 060	16 060	16 060
NJH14	356	7 830	9 520	9 160	9 520	16 640	19 040	19 040	19 040
NJH16	406	7 870	10 630	9 920	10 630	17 710	21 260	18 950	21 260
NJU10	241	6 180	7 030	7 030	7 030	12 810	14 100	14 100	14 100
NJU12	302	6 490	8 050	6 760	8 050	15 300	16 060	16 060	16 060
NJU14	356	8 590	9 520	9 300	9 520	17 610	19 040	19 040	19 040
NJU16	406	8 320	10 630	10 630	10 630	19 170	21 260	21 260	21 260
NJU18	457	6 890	11 250	7 380	11 250	16 990	19 930	17 390	22 550

Notes to Table 1:

- (1) Design values were developed in accordance with CAN/CSA-O86-01, “Engineering Design in Wood.”
- (2) All factored resistance values include the resistance factor and the reliability normalization factor (Kr).
- (3) Additional engineering data and load/span tables are available from the manufacturer.

4. Usage and Limitations

“NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” are intended for structural applications, such as floor joists, roof joists, blocking panels and rim joists. All prefabricated I-joists are intended for “dry service” use⁽¹⁾ applications only.

The following pre-engineering has been provided to CCMC by Nascor Ltd. to demonstrate compliance to the NBC 1995, Part 9, Housing and Small Buildings, for acceptance by the local authority having jurisdiction (AHJ):

i) Nascor Ltd.’s Pre-engineered Floor Span Charts

When “NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” are used as floor joists in simple spans supporting uniform loads only (including vibration criteria*), the installed spans must be in accordance with the Nascor Ltd. Span Chart for Canada, entitled:

“Nascor I-Joist Spans for CCMC-2004,” dated 03-12-22.

They shall be installed in accordance with the manufacturer’s installation guide, Nascor Ltd.’s “Specifier Guide” and “Specifier Guide — Supplement,” published by Nascor Ltd., dated April 2004. Applications outside the scope of these installation guidelines shall require engineering on a case-by-case basis.

**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 Ltd. should therefore be consulted for span adjustments, if necessary, in these types of installations.*

ii) Nascor Ltd.’s Pre-engineered Installation Details

Nascor Ltd.’s pre-engineered details within the above-mentioned documents are limited

in scope to building designs where the following details are not exceeded:

- web hole tables (Specifier Guide, pgs 9-12)
- stair opening, max. size 10 m² (Supplement)
- “NJ10-12” rim joist (Specifier Guide, pg 5)
- rimboard—proprietary capacity (Specifier Guide, pgs 5 and 6, and the Supplement)
- cantilevers (Specifier Guide, pgs 13-14), cantilever for brick (Supplement)
- roof span tables (Specifier Guide, pgs 15-17)
- floor installation details (Specifier Guide, pgs 5 and 6, and the Supplement)
- multiple-ply I-joists, side loads (Specifier Guide, pg 7, and the Supplement)
- web stiffeners (Specifier Guide, pg 8)
- roof installation details (Specifier Guide, pgs 19-20)
- I-joist hanger tables (Specifier Guide, pgs 21-22, and the Supplement)

iii) Engineering Required

For structural applications beyond the scope/limitations of the above-referenced Nascor Ltd. publications, or when required by the AHJ, the drawings or related documents shall 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 subclauses 4(i) and 4(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 and high seismicity
- stair openings not covered in the Supplement

- design of supporting wall studs/beams when total load exceeds the NBC 1995 pre-engineered floor/roof joist tables
- design of supporting foundation footings when total load exceeds the NBC 1995 pre-engineered floor/roof joist tables.

The engineer shall design in accordance with CAN/CSA-O86-01, "Engineering Design in Wood," 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

Nascor Ltd. provides engineering support and shall be consulted in the use of the "NJ10-12, NJH10-16 and NJU10-18 Series I-Joists." Nascor Ltd. technical services may be reached at: 403-243-8919.

This product shall be identified with the phrase "CCMC # 12564-R" along the side of the web or flange of the product. The CCMC number is only valid when it appears in conjunction with the certification mark of Intertek ETL Semko (WHI mark).

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

(1)General Note: 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 (M.C.) 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 M.C. 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 % M.C. is not exceeded in accordance with the NBC 1995. Article 9.3.2.5.

Figures 1 to 4 show generalized details of a prefabricated I-joist floor framing system. The construction, including accessories such as rim joists, squash blocks and web stiffeners, must be installed in accordance with the manufacturer's detailed instructions for the specific loading condition.

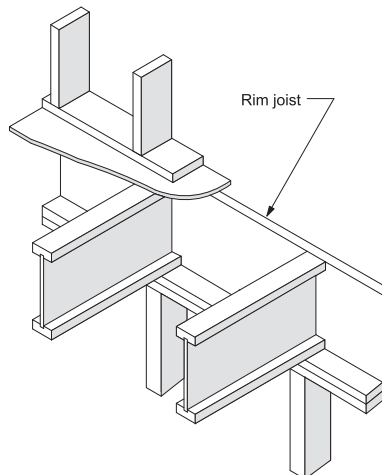


Figure 1. Rim joists

Note: Proper framing involves the installation of an adequate rim joist to transfer the gravity loads from the loadbearing exterior walls above, and to provide and ensure adequate floor diaphragm performance.

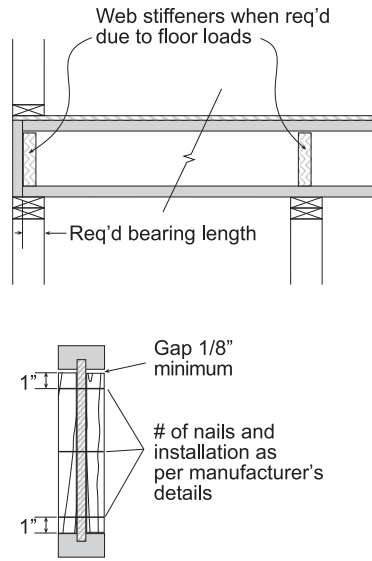


Figure 2. Web stiffeners

Note: When the floor loads are such that the web must be reinforced, web stiffeners are installed to successfully transfer the floor loads through to the bearing support. When web stiffeners are installed, the manufacturer's stiffener construction details, stiffener size and nailing schedule must be followed.

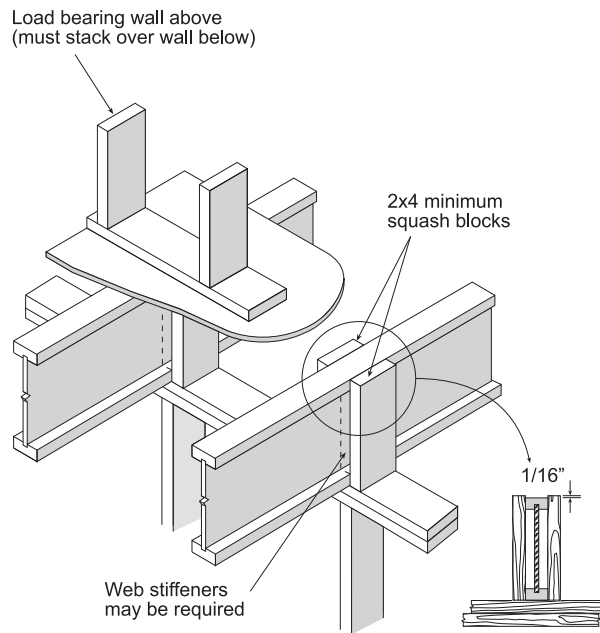


Figure 3. Squash Blocks

Note: Squash blocks are installed beneath interior loadbearing walls to transfer vertical gravity loads to beams or loadbearing walls below. Some rim joist details may also prescribe that squash blocks be installed in conjunction with the rim joist beneath exterior loadbearing walls.

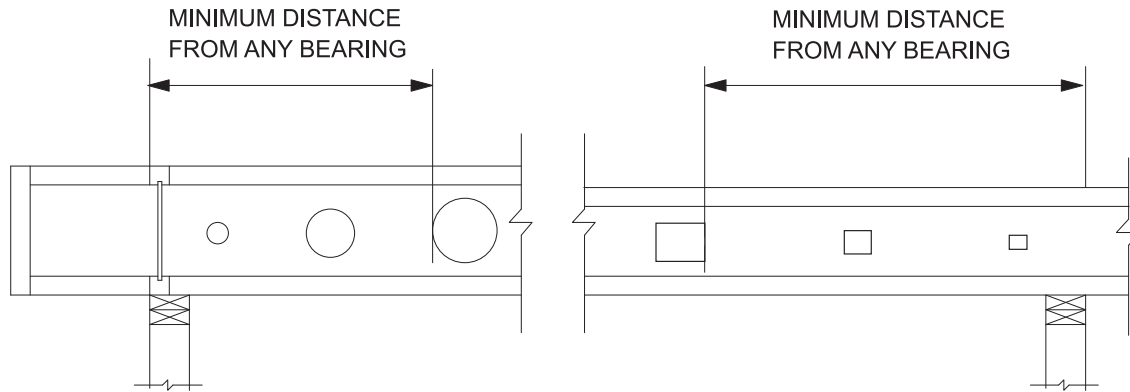


Figure 4. Permitted web openings

Note: See manufacturer's proprietary permitted web opening chart for permitted sizes and minimum distances to the support.

5. Performance

Structural testing of "NJ10-12, NJH10-16 and NJU10-18 Series I-Joists" was witnessed by an independent testing agency recognized by CCMC. The tests were in accordance with ASTM D 5055-93, "Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists." The test results are summarized below.

The original design values were obtained from testing to ASTM D 5055-93 and later versions of this standard were used for recently added I-joist products. Qualification tests were used to establish the applicable coefficient of variation, CV_w . The reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strengths.

Confidence in the bending moment design values, which are based on tests, is maintained through an enhanced quality assurance program, which includes proprietary grading rules, random sampling and ongoing testing at each plant. The third-party certification agency, Intertek ETL Semko (WHI mark), ensures that the quality control measures are adequate to maintain the published design values at each plant.

Shear Capacity

The shear capacity of "NJ10-12, NJH10-16 and NJU10-18 Series I-Joists" was established by computing the shear capacity for each depth separately as per ASTM D 5055-93. Qualification

tests were used to establish the applicable coefficient of variation, CV_w . 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 empirical method in accordance with ASTM D 5055-93. At each plant a minimum of 28 specimens of each joist depth were tested to verify the actual capacity versus the design capacity. Qualification tests were used to establish the applicable coefficient of variation, CV_w . The reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strength.

Stiffness

Stiffness capacity was tested in accordance with Section 6.5.2 of ASTM D 5055-93. The following formula was used to predict mid-span deflection:

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

where L = clear span (mm), w = load (kN/mm), EI = from Table 1 (kN mm²), K = from Table 1. 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 5055-00a. 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 was 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). Finger-joined lumber has been qualified through tension testing of 60 specimens and verification bending testing of 56 specimens. The finger-joined flange lumber design value is maintained through ongoing proof tension testing. The manufacture of the finger-joint meets NLGA SPS-1 standards and is verified by the certification agency.

Bearing Length

Confirmatory tests were conducted on 60 specimens at different bearing lengths (reinforced and unreinforced) to determine the minimum bearing length without stiffeners (38.1 mm) and stiffener performance. The span charts referred to in 4(i) are for joists without web stiffeners.

Vibration Criteria Qualification

Revised spans were prepared for “NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” 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 the “NJ10-12 Series I-Joists” products only.

Polyurethane Adhesive Qualification

Requalification bending and shear tests of “NJ10-12 Series I-Joists” produced with Huntsman LineStar™ polyurethane adhesive (qualified under CCMC # 13052-R) were conducted for the Nascor Systems, Nepean, ON plant. Published design values were maintained with the new adhesive.

Conclusion

“NJ10-12, NJH10-16 and NJU10-18 Series I-Joists” obtained shear and moment capacities in excess of the design values. Adequate performance was also achieved by the test specimens when tested for stiffness, creep, deflection and bearing.

Manufacturing Quality Assurance

The manufacturing quality assurance program has been adapted to include requirements specified in ASTM D 5055-93 and is verified by Intertek ETL Semko as part of the product certification.

For additional information contact:

Bruno Di Lenardo, P.Eng.
(613) 993-7769

*Issued by the Institute for Research in Construction
under the authority of the National Research Council*

John Flack, Ph.D.
Manager, CCMC

Note: Readers are asked to refer to limitations imposed by NRC on the interpretation and use of this report. These limitations are included in the introduction to CCMC's Registry of Product Evaluations, of which this report is part.

Readers are advised to confirm that this report has not been withdrawn or superseded by a later issue by referring to <http://irc.nrc.gc.ca/ccmc>, or contacting the Canadian Construction Materials Centre, Institute for Research in Construction, National Research Council of Canada, Montreal Road, Ottawa, Ontario, K1A 0R6; Telephone (613) 993-6189, Fax (613) 952-0268.