

CCMC 13216-R

CCMC Canadian code compliance evaluation

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| CCMC number: | 13216-R |
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| Evaluation holder: | Nordic Structures 100-1100, avenue des Canadiens-de-Montréal Montréal QC H3B 2S2 Canada Website: www.nordic.ca Telephone: 514-871-8526 Email: info@nordic.ca |
| Product name: | Nordic Lam™ |
| Code compliance: | NBC 2010, OBC |
| Evaluation requirements: | CCMC-TG-061813.03-10 "CCMC Technical Guide for Glulam Fabricated With Built-Up Laminations of Short-Length End-Jointed Lumber" |

In most jurisdictions this document is sufficient evidence for approval by Canadian authorities.

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Code compliance opinion

It is the opinion of the Canadian Construction Materials Centre that the evaluated product, when used as as glue-laminated timber beams and columns in accordance with the conditions and limitations stated in this evaluation, complies with the following code:

National Building Code of Canada 2010

| Code provision | Solution type |
|---|--------------------|
| 4.3.1.1. Design Basis for Wood | <u>Acceptable</u> |
| 4.3.1.2. Glued-Laminated Members | <u>Alternative</u> |
| 9.23.4.2. Spans for Joists, Rafters and Beams | <u>Alternative</u> |
| 9.23.10. Wall Studs | <u>Alternative</u> |

Ontario Building Code

Ruling No. 07-02-160 (13216-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 2007-02-05 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.

The above opinion is based on the evaluation by the CCMC of technical evidence provided by the evaluation holder, and is bound by the stated conditions and limitations. For the benefit of the user, a summary of the technical information that forms the basis of this evaluation has been included.

Product information

Product name

Nordic Lam™

Product description

The product is a glue-laminated timber construction made of black spruce in the tension and compression zones and/or Spruce-Pine-Fir (SPF) species in the core. All laminating boards (lamina) are surfaced to a thickness of 50 mm or less prior to lamination. The lamina is made of short-length pieces, typically 900 mm long with an occasional piece of not less than 685 mm long, and is end-jointed by means of a structural finger joint. Laminations of one or two grades are arranged within the depth of the member according to the desired layup pattern having one or three zones. Tables in the "[Technical information](#)" section of this Report outline the minimum layup requirements.

The lamina may also be made with multiple pieces of 38 mm × 38 mm lumber graded in accordance with standard grading rules and facebonded. The face bonding and end joints are bonded with a polyurethane adhesive (for end-joints: Ashland UX-100/WD3-A22, CCMC 13512-L; for edge and face laminations: Ashland WD3-A322/CX-47, CCMC 13591-L).

The Engineered Wood Association (APA) conducts regular audits of the manufacturing plant and the quality assurance program to CSA O177-06, "Qualification Code for Manufacturers of Structural Glued-Laminated Timber." The engineering properties of the product are listed in the Tables in the "[Technical information](#)" section. The specified strengths for limit states design were based on the format conversion used in CSA O86 for conventional glulam. Additional engineering data is available from the manufacturer.

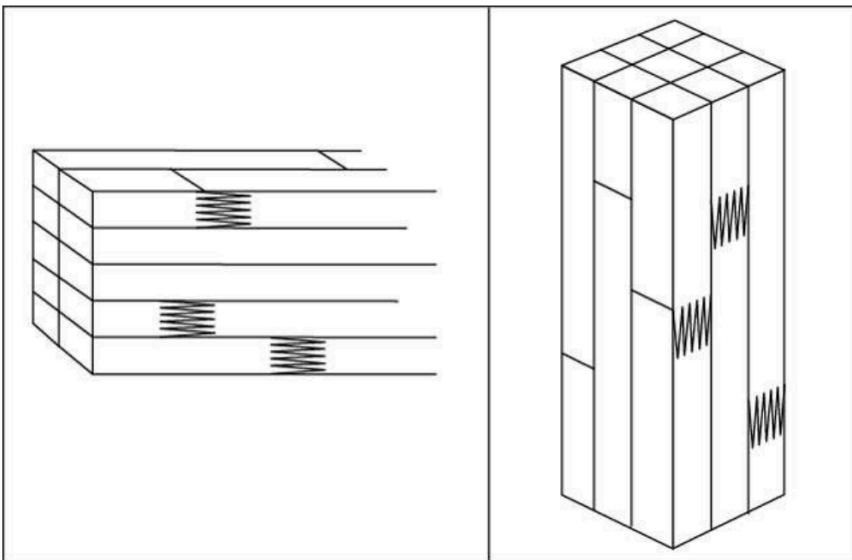


Figure 1. Examples of the product – finger-jointed, short-length, face-bonded laminations in a beam and a column

Manufacturing plant

This evaluation is valid only for products produced at the following plant:

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| Product name | Manufacturing plant |
|--------------|---------------------|
| | Chibougamau, QC, CA |
| Nordic Lam™ | ☑ |

☑ Indicates that the product from this manufacturing facility has been evaluated by the CCMC

Conditions and limitations

The CCMC's compliance opinion is bound by this product being used in accordance with the conditions and limitations set out below.

- The product is intended for use where conventional glulam beams and columns are permitted for structural use by the NBC 2010.
- The product is intended for use in dry service conditions only. ⁽¹⁾
- The glulam beams covered within the scope of this Report must not exceed 2.0 m³ in volume and 600 mm in depth based on empirical data provided.
- The product has met the adhesive testing requirements for Annexes A.2, "Small-scale flame test," and A.4, "Elevated temperature performance," of CSA O177. The intent of Annexes A.2 and A.4 is to provide information for decision-making by the designer or the authority having jurisdiction (AHJ) to determine whether the formulas in Appendix D-2.11, Glued-Laminated Timber Beams and Columns, of Division B of the NBC 2010, apply to these proprietary glulam columns/beams with an adhesive qualified under CSA O112.9 rather than a PRF complying to CSA O112.7, on which the formulas are based.
 - Annex A.3 provides for full-scale fire tests confirming compliance to Appendix D-2.11 of the NBC 2010, which have not been conducted.
- The pre-engineering details outlined below have been provided to CCMC by the manufacturer to demonstrate compliance to Part 9, Housing and Small Buildings, of the NBC 2010 for acceptance by the local AHJ:

i. Nordic Structures Pre-engineered Tables ⁽²⁾

When the product is used as beams, headers columns or wall studs, the installation must be in accordance with the spans and details found in the following documents, in limit states design for Canada:

- Nordic Lam™, "Beams and Headers," dated June 2013,
- Nordic Lam™, "Beams and Headers, commercial depths," dated June 2013,
- Nordic Lam™, "Columns," dated June 2013,
- Nordic Lam™, "1 ¾-inch Wall Studs," dated April 2014,
- Nordic Lam™, "1 ½-inch Wall Studs," dated April 2014,
- Nordic Lam™, "Residential Design/Construction Guide," dated April 2014, and
- Nordic Lam™, "Construction Details for Residential Applications," dated December 2013.

ii. Nordic structures installation details

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

- floor loads,
- roof loads,
- garage door headers,
- bearing length requirements,
- connections for multiple-piece members,
- columns,
- floor framing details,
- garage door header framing details,
- holes in beams and headers, and
- tapered cut.

iii. Engineering Required

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For structural applications beyond the scope/limitations of the above-referenced 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 Sections (i) and (ii) imply, but are not limited to, the following:

- higher loads/longer spans than the manufacturer's pre-engineered details,
- concentrated loads,
- areas of high wind or high seismicity,
- nonbearing-type fastener designs,
- design of supporting foundation footings when the total load exceeds the NBC 2010 pre-engineered floor/ roof joist spans and beam spans, and
- fire-resistance ratings.

iv. **Engineering Support Provided by Manufacturer**

The manufacturer provides engineering support and offers the following customer support contact numbers: 514-871-8526 or toll-free 866-817-3418.

- Damaged or defective products must not be used unless repaired in accordance with written instructions from the manufacturer.
- This product must be identified with the phrase "CCMC 13216-R" along the side or top of the glulam member. This CCMC number is only valid when it appears in conjunction with the APA-EWS certification mark.

Notes:

- 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 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 an MC between 6% and 14% depending on 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 2010.
 - 2 The pre-engineered tables present the pre-engineered factored resistance of the product. The AHJ may require further engineering to determine the factored load in accordance with Part 4 of Division B of the NBC 2010.
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Technical information

This evaluation is based on demonstrated conformance with the following criteria:

| Criteria number | Criteria name |
|----------------------|---|
| CCMC-TG-061813.03-10 | CCMC Technical Guide for Glulam Fabricated With Built-Up Laminations of Short-Length End-Jointed Lumber |

Table 1. Beam Specified Strengths (MPa) ⁽¹⁾ ⁽²⁾ ⁽³⁾

| Property | Appearance grade | Type of beam | |
|---|--|--------------|-----------|
| | | 20F-1.6E | 24F-1.9E |
| Engineering properties | Stress grade | 20F-1.6E | 24F-1.9E |
| | Layup combination | 20F-E8M1 | 24F-ES1M1 |
| | | | |
| Bending about X-X axis (loaded perpendicular to wide face of laminations) | Bending moment (F_{bx}) ⁽⁴⁾ ⁽⁵⁾ | 25.6 | 30.7 |
| | Longitudinal shear (F_{vx}) ⁽⁶⁾ | 2.2 | 2.2 |
| | Compression perpendicular to grain (F_{cp}) ⁽⁴⁾ | 5.8 | 7.5 |
| | True modulus of elasticity (E) | 11 000 | 13 100 |
| | Apparent modulus of elasticity (E) | 10 300 | 12 400 |
| Bending about Y-Y axis (loaded parallel to wide face of laminations) | Bending moment (F_{by}) ⁽⁴⁾ ⁽⁵⁾ | 13.4 | 14.1 |
| | Longitudinal shear (F_{vy}) ⁽⁶⁾ | 1.5 | 1.5 |
| | Compression perpendicular to grain (F_{cp}) ⁽⁴⁾ | 3.9 | 3.8 |
| | True modulus of elasticity (E) | 10 300 | 11 000 |
| | Apparent modulus of elasticity (E) | 9 700 | 10 300 |
| Axially loaded | Compression parallel to grain (F_c) | 14.4 | 16.5 |
| | Tension parallel to grain (F_t) | 10.2 | 13.4 |
| | Modulus of elasticity (E) | 9 700 | 11 000 |

Notes:

- 1 Design of glulam members must be in accordance with CSA O86.
- 2 The tabulated design values are for dry service conditions and for standard term duration of load.
- 3 The 20F-1.6E and 24F-1.9E stress grades are primarily used for headers and beams, respectively. Designers should check the availability of a grade before specifying.

- 4 Bending members of the product are symmetrical throughout the depth of the member.
- 5 Specified strengths in bending have been adjusted for volume (adjusted to CSA O86 standard beam of 130 mm x 610 mm x 9 100 mm). In calculating the size factor for bending K_{Zbg} , the beam width, b, must be taken as the full member width.
- 6 Specified shear strengths have been adjusted to 2.0 m³ of beam volume.

Table 2. Column Specified Strengths (MPa) ⁽¹⁾ ⁽²⁾ ⁽³⁾

| Property | Type of column | | |
|---|--|------------------------|------------------------|
| | Industrial | ES11 ⁽⁴⁾ | ES12 ⁽⁴⁾ |
| Engineering properties | Appearance grade | Industrial | |
| | Stress grade | ES11 ⁽⁴⁾ | ES12 ⁽⁴⁾ |
| | Layup combination(s) | ES11 | ES12 |
| Bending about X-X axis (loaded perpendicular to wide face of laminations) | Bending moment (F_{bx}) ⁽⁵⁾ ⁽⁶⁾ | 17.2 | 24.9 |
| | Longitudinal shear (F_{vx}) | 2.2 | 2.2 |
| | Compression perpendicular to grain (F_{cp}) ⁽⁵⁾ | 5.8 | 7.5 |
| | True modulus of elasticity (E) | 11 000 | 13 100 |
| | Apparent modulus of elasticity (E) | 10 300 | 12 400 |
| Bending about Y-Y axis (loaded parallel to wide face of laminations) | Bending moment (F_{bx}) ⁽⁵⁾ ⁽⁶⁾ | 22.4 | 30.7 |
| | Longitudinal shear (F_{vx}) | 1.5 | 1.5 |
| | Compression perpendicular to grain (F_{cp}) ⁽⁵⁾ | 5.8 | 7.0 |
| | True modulus of elasticity (E) | 11 000 | 13 100 |
| | Apparent modulus of elasticity (E) | 10 300 | 12 400 |
| Axially loaded | Compression parallel to grain (F_c) | 22.3 | 33.0 |
| | Tension parallel to grain (F_t) | 12.5 | 20.4 |
| | Modulus of elasticity (E) | 10 300 | 12 400 |

Notes:

- 1 Design of glulam members must be in accordance with CSA O86.
- 2 The tabulated design values are for dry service conditions and for standard term duration of load.
- 3 The design values are based on four or more laminations. For ES11 made of three laminations, F_{bx} must be taken as 20.4 MPa and F_c as 19.4 MPa. For ES12 made of three laminations, F_c must be taken as 24.4 MPa.

- 4 The ES11 and ES12 stress grades are primarily used for wall studs and columns, respectively. Designers should check the availability of a grade before specifying.
- 5 Compression members of the product are symmetrical throughout the depth of the member.
- 6 Specified strengths in bending have been adjusted for volume (adjusted to CSA O86 standard column of 130 mm x 610 mm x 9 100 mm). In calculating the size factor for bending, K_{zbg} , the beam width, b , must be taken as the full member width.

Table 3. Beam Layup Combinations Grade Requirements

| Property | Type of beam | |
|------------------------|-----------------------------|-----------------------------|
| Appearance grade | Industrial | |
| Stress grade | 20F-1.6E | 24F-1.9E |
| Layup combination | 20F-E8M1 | 24F-ES1M1 |
| Outer compression zone | 4 lams to 343 mm, 10% 2250f | 4 lams to 600 mm, 25% 2250f |
| | > 343 to 457 mm, 20% 2250f | |
| Inner | 1650f | 1650f |
| Outer tension zone | 4 lams to 343 mm, 10% 2250f | 4 lams to 600 mm, 25% 2250f |
| | > 343 to 457 mm, 20% 2250f | |

Table 4. Column Layup Combinations Grade Requirements

| Property | Type of beam | |
|-------------------|-------------------------|-------------------------|
| Appearance grade | Industrial | |
| Stress grade | ES11 | ES12 |
| Layup combination | ES11 | ES12 |
| Uniform grade | 2 lams to 381 mm, 1650f | 2 lams to 381 mm, 2250f |

Grade designations are as follows:

- E-rated 2250f has a minimum long-span, E , of 11 790 MPa (1.71×10^6 psi) and a mean long-span, E , or 13 100 MPa (1.90×10^6 psi).
- E-rated 1650f has a minimum long-span, E , of 9 650 MPa (1.40×10^6 psi) and a mean long-span, E , or 10 300 MPa (1.50×10^6 psi).

Additional test information

The product with built-up lamina that is made of short-length end-jointed and edge-bonded lumber laminations (i.e. less than 1830 mm long) is not covered in commodity-type glulam by CAN/CSA-O122-06, "Structural Glued-Laminated Timber." In this case, the proprietary laminations are manufactured differently than described in CAN/CSA-O122, but are produced to match the same 20f and 24f conventional glulam stress grades to allow for direct substitution of the conventional laminations.

The equivalency being sought is with respect to producing conventional 20f and 24f stress grades. This was accomplished by establishing bending strength and stiffness that are equivalent to or better than conventional glulam lamination grades. The quality of manufacturing of new built-up short-length lamina in proprietary layup designs will be equivalent to glulam manufactured in accordance with CAN/CSA-O122. In addition, beams covered within the scope of this Report are limited to a maximum of 2.0 m³ in volume and 600 mm depth of beams.

| Property | Test information |
|--|---|
| Short-length elements | The short-length lumber elements are typically 900 mm with an occasional piece of not less than 685 mm. The laminating effect of joining 38 mm x 38 mm short lengths and face-bonding was demonstrated by testing a statistical sample of short-length end-joints, jointed short-length elements, and 38 mm x 140 mm lamina made of short-length elements. In production, the jointed elements are proof-loaded at the full-length. |
| Tension | Tension testing of 102 samples of various lamina grades was conducted to confirm the design tension values. |
| Modulus of elasticity | Long span E was confirmed on statistical samples of all grades of lamina |
| Moment capacity | The moment capacity predictions were confirmed through testing of sixty (60) beams of 20f and 24f grades at 300-mm and 400-mm depths. Fifteen (15) beams of 600-mm depth were also tested. |
| Shear capacity | Thirty (30) short beams of 450-mm depth were tested to confirm the characteristic value. |
| Compression parallel to grain | Thirty (30) short column tests were conducted to 89 mm x 89 mm and 140 mm x 140 mm columns to confirm the characteristic value. |
| Fasteners | Fastener tests were not conducted to establish an "equivalent" species for fastener design. SPF species are recommended for fastener design as a conservative approach. |
| Manufacturing quality assurance | The manufacturing quality assurance program follows the principles of CSA O177 AND ANSI 190.1, which is verified by APA-EWS as part of the plant qualification. |
| Adhesives | The face and edge bonding and end joints are bonded with either a phenol-resorcinol adhesive or a polyurethane adhesive. The products are currently qualified with the following adhesives: <ul style="list-style-type: none"> • for end joints: Ashland UX-100/WD3A22, CCMC 13512-L, and • for edge and face laminations: Ashland WD3-A322/CX-47, CMCC 13591-L |

Administrative information

Disclaimer

This evaluation is issued by the Canadian Construction Materials Centre (CCMC), a part of the Construction Research Centre at the National Research Council of Canada (NRC). The evaluation must be read in the context of the entire [CCMC Registry of Product Assessments](#) and the legislated applicable building code in effect.

The CCMC was established in 1988 on behalf of the applicable regulator (i.e., the provinces and territories) to ensure—through assessment—conformity of alternative and acceptable solutions to regional building codes as determined by the local authority having jurisdiction (AHJ) as part of the issuance of a building permit.

It is the responsibility of the local AHJs, design professionals, and specifiers to confirm that the evaluation is current and has not been withdrawn or superseded by a later issue. Please refer to [the website](#) or contact:

Canadian Construction Materials Centre

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Language

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CCMC recognition

The Canadian Construction Materials Centre (CCMC) assesses compliance with Canadian building, energy and safety codes. We are the only construction code compliance service supported and operated by the Government of Canada. Trusted by over 6,000 regulators across Canada.

Most Canadian authorities having jurisdiction (AHJs) consider CCMC product assessments acceptable as evidence for product approval.

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(Alliance of Canadian Building Official Associations (ACBOA))

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Canadian Home Builders' Association (CHBA)



(Canadian Home Builders' Association (CHBA))

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For more information, contact the CCMC by phone at (613) 993-6189 or by email at ccmc@nrc-cnrc.gc.ca

Code compliance as an acceptable solution

Code Compliance via Acceptable Solutions

If a building design (e.g. material, component, assembly or system) can be shown to meet all provisions of the applicable **acceptable solutions** in Division B (e.g. it complies with the applicable provisions of a referenced standard), it is deemed to have satisfied the objectives and functional statements linked to those provisions and thus to have complied with that part of the Code.

— National Building Code of Canada, Sentence A-1.2.1.1.(1)(a)

The CCMC has determined that compliance with this provision of the Code has been demonstrated as an **Acceptable Solution**. The evaluation report provides a summary of the basis of CCMC's compliance opinion.

CCMC's code compliance opinions

All CCMC evaluation reports are opinions of code compliance established in accordance with the National Building Code of Canada, Subsection 1.2.1. "Compliance with this Code," which requires compliance to be achieved by:

- complying with the applicable acceptable solutions in Division B, or
- using an alternative solution that will achieve at least the minimum level of performance required by Division B in the areas defined by the objective and functional statements attributed to the applicable acceptable solutions.

The CCMC assesses compliance with Canadian building, energy and safety codes, and is trusted by over 6,000 regulators across Canada.

Code compliance as an alternative solution

Code Compliance via Alternative Solutions

Where a design differs from the acceptable solutions in Division B, then it should be treated as an **"alternative solution."** A proponent of an alternative solution must demonstrate that the alternative solution addresses the same issues as the applicable acceptable solutions in Division B and their attributed objectives and functional statements. However, because the objectives and functional statements are entirely qualitative, demonstrating compliance with them in isolation is not possible. Therefore, Clause 1.2.1.1.(1)(b) identifies the principle that Division B establishes the quantitative performance targets that alternative solutions must meet. In many cases, these targets are not defined very precisely by the acceptable solutions [...] Nevertheless, Clause 1.2.1.1.(1)(b) makes it clear that an effort must be made to demonstrate that an alternative solution will perform as well as a design that would satisfy the applicable acceptable solutions in Division B—not “well enough” but “as well as.”

— National Building Code of Canada, Sentence A-1.2.1.1.(1)(b)

The CCMC has determined that compliance with this provision of the Code has been demonstrated as an **Alternative Solution**. The evaluation report provides a summary of the basis of CCMC's compliance opinion.

CCMC's code compliance opinions

All CCMC evaluation reports are opinions of code compliance established in accordance with the National Building Code of Canada, Subsection 1.2.1. "Compliance with this Code," which requires compliance to be achieved by:

- complying with the applicable acceptable solutions in Division B, or
- using an alternative solution that will achieve at least the minimum level of performance required by Division B in the areas defined by the objective and functional statements attributed to the applicable acceptable solutions.

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