

## **Nordic X-Lam Nordic Structures**

**PR-L306C**

Revised March 17, 2017

Products: Nordic X-Lam  
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 of Division B
  - CAN/CSA O86-14 (reprint 2016) Engineering Design in Wood
  - ANSI/APA PRG 320-2012 Performance Rated Cross-Laminated Timber
  - FPInnovations Reports 201002775, 201004981, 301010401, and 301010956, and other qualification data
2. Product description:

Nordic X-Lam cross-laminated timber (CLT) is manufactured with spruce-pine-fir in accordance with the E1 or custom grades of ANSI/APA PRG 320 through product qualification and/or mathematical models using principles of engineering mechanics. Nordic X-Lam can be used in floor, roof, and wall applications, and is manufactured in a plank billet with nominal widths of 305 to 2438 mm (12 to 96 inches), thicknesses of 76 to 381 mm (3 to 15 inches), and lengths up to 19.5 m (64 feet).
3. Design properties:

Nordic X-Lam CLT shall be designed with the design properties and capacities provided in Tables 1, 2, and 3, or with the maximum load table provided by the manufacturer ([www.nordic.ca/en/documentation/technical-documents](http://www.nordic.ca/en/documentation/technical-documents)). The design adjustment factors, shall be based on CSA O86, the recommendations provided by the manufacturer, or the 2011 Canadian CLT Handbook ([www.fpinnovations.ca/Pages/CLTForm.aspx](http://www.fpinnovations.ca/Pages/CLTForm.aspx)), and approved by the engineer of record. The lateral resistance of Nordic X-Lam CLT, when used as shearwalls or diaphragms, depends on the panel-to-panel connection and anchorage designs, and shall be consulted with the CLT manufacturer and approved by the engineer of record.
4. Product installation:

Nordic X-Lam CLT shall be installed in accordance with the recommendations provided by the manufacturer (see link above) and the engineering drawing approved by the engineer of record. Permissible details shall be in accordance with the engineering drawing.
5. Fire-rated assemblies:

Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer (see link above). Procedures specified in Annex B of CSA O86 or Chapter 8 of the 2011 Canadian CLT Handbook (see link above) may be used in the fire design of Nordic X-Lam CLT when approved by the authority having jurisdiction.

Nordic X-Lam CLT has been tested in accordance with CAN/ULC S102-10, and meets the flame-spread rating of 26 – 75 and smoke developed classification of 0 – 450.

6. Limitations:
  - a) Nordic X-Lam CLT shall be designed in accordance with principles of mechanics using the design properties specified in this report or provided by the manufacturer.
  - b) Nordic X-Lam products shall be limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber over a year is 15 percent or less and does not exceed 19 percent.
  - c) Design properties for Nordic X-Lam CLT, when used as beams or lintels with loads applied parallel to the face-bond gluelines, are beyond the scope of this report.
  - d) Nordic X-Lam CLT shall be manufactured in accordance with layup combinations specified in ANSI/APA PRG 320 or proprietary Nordic X-Lam CLT manufacturing specifications documented in the in-plant manufacturing standard approved by APA.
  - e) Nordic X-Lam CLT is produced at the Nordic Structures, Chibougamau, Quebec facilities under a quality assurance program audited by APA.
  - f) This report is subject to re-examination in one year.
  
7. Identification:

Nordic X-Lam CLT described in this report is identified by a label bearing the manufacturer's name (Nordic Structures) and/or trademark, the APA assigned plant number (1112), the product standard (ANSI/APA PRG 320), the APA logo, the CLT grade (E1), the report number PR-L306, and a means of identifying the date of manufacture.

Table 1. Specified Strengths and Modulus of Elasticity<sup>(a)</sup> for Lumber Laminations Used in Nordic X-Lam (for Use in Canada)

CLT Grade	Lumber Laminations Used in Major Strength Direction						Lumber Laminations Used in Minor Strength Direction					
	f <sub>b,0</sub> (MPa)	E <sub>0</sub> (MPa)	f <sub>t,0</sub> (MPa)	f <sub>c,0</sub> (MPa)	f <sub>v,0</sub> (MPa)	f <sub>s,0</sub> (MPa)	f <sub>b,90</sub> (MPa)	E <sub>90</sub> (MPa)	f <sub>t,90</sub> (MPa)	f <sub>c,90</sub> (MPa)	f <sub>v,90</sub> (MPa)	f <sub>s,90</sub> (MPa)
E1	28.2	11,700	15.4	19.3	1.5	0.5	7.0	9,000	3.2	9.0	1.5	0.5

For Imperial: 1 MPa = 145.04 psi

<sup>(a)</sup> Tabulated values are Limit States design values and not permitted to be increased for the lumber size adjustment factor in accordance with CSA O86. The design values shall be used in conjunction with the section properties provided by the CLT manufacturer based on the actual layup used in manufacturing the CLT panel (see Table 2).

Table 2. Unfactored Limit States Design Bending Resistances<sup>(a)</sup> for Nordic X-Lam Listed in Table 1 (for Use in Canada)

CLT Grade <sup>(b)</sup>	Layup # <sup>(c)</sup>	Thick-ness (mm)	Lamination Thickness (mm) in CLT Layup						Major Strength Direction					Minor Strength Direction					
			=	⊥	=	⊥	=	⊥	=	F <sub>b</sub> S <sub>eff,0</sub> (10 <sup>6</sup> N-mm/m)	E <sub>I</sub> <sub>eff,0</sub> (10 <sup>9</sup> N-mm <sup>2</sup> /m)	GA <sub>eff,0</sub> (10 <sup>6</sup> N/m)	V <sub>r,0</sub> (kN/m)	G <sub>v,t,0</sub> <sup>(d)</sup> (10 <sup>6</sup> N/m)	F <sub>b</sub> S <sub>eff,90</sub> (10 <sup>6</sup> N-mm/m)	E <sub>I</sub> <sub>eff,90</sub> (10 <sup>9</sup> N-mm <sup>2</sup> /m)	GA <sub>eff,90</sub> (10 <sup>6</sup> N/m)	V <sub>r,90</sub> (kN/m)	G <sub>v,t,90</sub> <sup>(d)</sup> (10 <sup>6</sup> N/m)
E1	78-3s	78	25.8	26.8	25.8					24	452	5.4	25	20	0.84	14	6.9	9.0	20
	89-3s	89	34.9	19.1	34.9					31	678	7.5	29	22	0.42	5.2	5.7	6.4	22
	105-3s	105	34.9	34.9	34.9					42	1,081	7.3	34	26	1.40	32	9.0	12	26
	131-5s	131	25.8	26.8	25.8	26.8	25.8			54	1,735	11	35	33	7.1	363	14	26	33
	140-4s	140	34.9	2 x 34.9	34.9					68	2,334	8.5	41	35	5.7	256	18	23	35
	143-5s	143	34.9	19.1	34.9	19.1	34.9			72	2,514	15	42	36	5.5	260	11	22	36
	175-5s	175	34.9	34.9	34.9	34.9	34.9			97	4,140	15	46	44	12	831	18	34	44
	197-7s	197	34.9	19.1	34.9	19.1	34.9	19.1	34.9	128	6,152	23	54	49	12	1,015	17	28	49
	213-7l	213	2 x 34.9	19.1	34.9	19.1	2 x 34.9			174	9,056	36	68	53	5.5	260	21	22	53
	220-7s	220	34.9	26.8	34.9	26.8	34.9	26.8	34.9	149	8,019	22	57	55	19	1,884	22	37	55
	244-7s	244	34.9	34.9	34.9	34.9	34.9	34.9	34.9	172	10,240	22	59	61	28	3,163	27	46	61
	244-7l	244	2 x 34.9	34.9	34.9	34.9	2 x 34.9			221	13,194	31	75	61	12	831	28	34	61
	267-9l	267	2 x 34.9	19.1	34.9	19.1	34.9	19.1	2 x 34.9	264	17,211	43	83	67	12	1,015	27	28	67
	314-9l	314	2 x 34.9	34.9	34.9	34.9	34.9	34.9	2 x 34.9	342	26,272	37	91	79	28	3,163	37	46	79

For Imperial: 1 mm = 0.0394 in.; 1 m = 3.28 ft; 1 N = 0.2248 lbf

- (a) Tabulated values are unfactored Limit States design values and not permitted to be increased for the lumber size adjustment factor in accordance with CSA O86.
- (b) The CLT grades are developed based on ANSI/APA PRG 320, as permitted by the standard.
- (c) The layup designation refers to the panel thickness (in mm), the number of layers, and the layup combination ("s" for standard perpendicular layers, and "l" for doubled outermost parallel layers).
- (d) G<sub>v</sub> = 250 MPa based on product performance testing.

Table 3. Limit States Specified In-Plane Shear Strength (MPa) for Nordic X-Lam<sup>(a)</sup> (for use in Canada)

CLT Grade	Layup #	Thickness (mm)	Specified In-Plane Shear Strength (MPa), $f_{v, \text{in-plane}}$ , with Face Lamination Orientation of	
			=	⊥
E1	78-3s	78	1.35 <sup>(b)</sup>	1.67 <sup>(b)</sup>
	89-3s	89	0.96	1.67 <sup>(b)</sup>
	105-3s	105	1.35	1.67
	131-5s	131	1.60 <sup>(c)</sup>	1.92 <sup>(c)</sup>
	140-4s	140	1.35 <sup>(b)</sup>	1.67 <sup>(b)</sup>
	143-5s	143	1.35 <sup>(b)</sup>	1.92 <sup>(c)</sup>
	175-5s	175	1.60	1.92
	197-7s	197	1.35 <sup>(b)</sup>	1.92 <sup>(c)</sup>
	213-7l	213	1.60 <sup>(c)</sup>	1.92 <sup>(c)</sup>
	220-7s	220	1.60 <sup>(c)</sup>	1.92 <sup>(c)</sup>
	244-7s	244	1.60 <sup>(c)</sup>	1.92 <sup>(c)</sup>
	244-7l	244	1.60 <sup>(c)</sup>	1.92 <sup>(c)</sup>
	267-9l	267	1.35 <sup>(b)</sup>	1.92 <sup>(c)</sup>
	314-9l	314	1.60 <sup>(c)</sup>	1.92 <sup>(c)</sup>

For Imperial: 1 MPa = 145.04 psi

- (a) The tabulated values are for Limit States Design (LSD).
- (b) Based on test results from 105-3s.
- (c) Based on test results from 175-5s.

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