APA PRODUCT REPORT®

Nordic Lam™
Nordic Structures

PR-L294
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Products: Nordic Lam™
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1. Basis of the product report:
   - 2024 International Building Code (IBC): Sections 104.2.3 Alternative materials and 2303.1.3 Structural glued-laminated timber
   - 2021, 2018, and 2015 IBC: Sections 104.11 Alternative materials and 2303.1.3 Structural glued-laminated timber
   - 2024 International Residential Code (IRC): Sections R104.2.2 Alternative materials, and R502.1.3, R602.1.3, and R802.1.2 Structural glued-laminated timbers
   - 2021, 2018, and 2015 IRC: Sections R104.11 Alternative materials, and R502.1.3, R602.1.3, and R802.1.2 Structural glued laminated timber
   - ANSI 117-2020 and ANSI 117-2015 recognized in the 2024 and 2021 IBC and IRC, and 2018 IBC and IRC, respectively, and AITC 117-10 recognized in the 2015 IBC
   - ANSI A190.1-2022, ANSI A190.1-2017, and ANSI A190.1-2012 recognized in the 2024 IBC and IRC, 2021 and 2018 IBC and IRC, and 2015 IBC and IRC, respectively
   - 2024, 2018, and 2015 ANSI/AWC NDS, National Design Specification for Wood Construction recognized in the 2024 IBC and IRC, 2021 and 2018 IBC and IRC, and 2015 IBC and IRC, respectively
   - ASTM D3737-18e1 and D3737-12 recognized in the 2024 and 2021 IBC and IRC, and 2018 and 2015 IBC and IRC, respectively
   - APA Reports T2001P-85, T2003P-21, T2004P-43, T2005P-74, T2006P-45, T2008P-91, T2009P-39, and T2012P-41, FPInnovations Reports 201003404, 201003409, 201005209, 301008842, 301009694, and 301011496, and other qualification data

2. Product description:
   Nordic Lam™ is structural glued laminated timber (glulam) manufactured with Spruce-Pine-Fir (mainly Black Spruce) lumber in accordance with layup combinations developed in accordance with the principle of ASTM D3737, ASTM D7341, and full-scale tests. The end joints within the Nordic Lam are randomly spaced between adjacent laminations and are not required to be spaced a minimum of 6 inches apart, and the end joints in the same lamination are not required to be spaced a minimum of 6 feet apart. Nordic Lam is used as beams, headers, rafters, purlins, columns, studs, and decking, and is manufactured in nominal widths ranging from 1-1/2 to 27 inches, a variety of depths, and lengths up to 80 feet, in accordance with Table 1.

3. Design properties:
   Table 2 lists the allowable design properties for Nordic Lam beams. The allowable spans for Nordic Lam beams shall be in accordance with the recommendations provided by the manufacturer (www.nordic.ca/en/documentation/technical-documents/ns-gt5-us), and APA Data File*: Glued Laminated Beam Design Tables*, Form S475 (www.apawood.org/resource-library), as applicable.

   Table 3 lists the allowable design properties for Nordic Lam columns. The allowable loads for Nordic Lam columns shall be in accordance with the recommendations provided by the manufacturer (www.nordic.ca/en/documentation/technical-documents/ns-gt5-us),

and APA Data File: *Design of Structural Glued Laminated Timber Columns*, Form Y240 (see link above), as applicable.

Design values for the Load and Resistance Factor Design (LRFD) used in the U.S. for Nordic Lam beams and columns can be derived from the ASD values published in Tables 2 and 3 of this report in accordance with Tables 5.3.1, N1, N2, and N3 of the 2018 National Design Specification for Wood Construction (NDS).

4. Product installation:
Nordic Lam beams and columns shall be installed in accordance with the recommendations provided by the manufacturer (www.nordic.ca/en/documentation/technical-documents/ns-gt5-us) and APA Construction Guide: *Glulam Connection Details*, Form T300 (see link above). Permissible field notching and drilling of Nordic Lam beams shall be in accordance with the recommendations provided by the manufacturer and APA Technical Notes: *Field Notching and Drilling of Glued Laminated Timber Beams*, Form S560, and *Effect of Large Diameter Horizontal Holes on the Bending and Shear Properties of Structural Glued Laminated Timber*, Form V700 (see link above). Permissible field notching and drilling of Nordic Lam columns shall be in accordance with the recommendations provided by the manufacturer.

5. Fire-rated assemblies:
Design of fire-resistant exposed wood members in accordance with Chapter 16 of the NDS, AWC Fire Design Specification for Wood Construction (FDS), or Section 722.1 of the 2024, 2021, 2018, and 2015 IBC shall be applicable to Nordic Lam beams and columns. Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer (see link above) and APA Design and Construction Guide: *Fire-Rated Systems*, Form W305 (see link above). 1,350F_b-1.6E/ES1 Nordic Lam beams with a minimum net depth of 9-1/4 inches meet the 2x10 lumber criteria specified in Exception 4 of Section R302.13 of the 2024, 2021, 2018, and 2015 IRC, *Fire Protection of Floors*.

Nordic Lam has been tested in accordance with ASTM E84 and meets the Class A rating for flame spread index (0 – 25) and smoke-developed index (0 – 450) when the glulam depth is at least 3.4 inches (86 mm). The Class B rating for flame spread index (26 – 75) and smoke-developed index (0 – 450) shall be applicable to Nordic Lam with a depth that is less than 3.4 inches (86 mm). These values apply to Nordic Lam without surface treatment (e.g., protective coatings, sealants, primers, stains, etc.). For flame-spread ratings and smoke developed classifications with a surface treatment, refer to the manufacturer.

6. Limitations:
   a) Nordic Lam beams and columns shall be designed in accordance with the applicable code and the National Design Specification for Wood Construction using the allowable design properties specified in this report.
   b) The dimensions of Nordic Lam beams and columns shall follow those specified in Table 1.
   c) Nordic Lam beams and columns shall be manufactured in accordance with layup combinations specified in ANSI 117 or proprietary Nordic Lam manufacturing specifications documented in the in-plant manufacturing standard approved by APA.
   d) Nordic Lam is produced at the Nordic Structures, Chibougamau, Quebec facilities under a quality assurance program audited by APA.
   e) This report is subject to re-examination in one year.

7. Identification:
Nordic Lam described in this report is identified by a label bearing the manufacturer's name (Nordic Structures) and/or trademark, the APA assigned plant number (1057), the product standard (ANSI A190.1), the APA logo, the combination symbol, the report number PR-L294, and a means of identifying the date of manufacture.

Table 1. Dimensions for Nordic Lam layups

Layup	Minimum width (in.)	Maximum width (in.)	Minimum depth	Maximum depth (in.)
1,350F_b-1.6E/ES1	1-1/2	1-1/2	7-1/8 in.	15
20F-E8M1	1-1/2	7-1/2	4 lams	18
20F-ES/CPG	3-1/8[1]	3-1/2	4 lams	18
24F-E/ES1M1	1-1/2	7-1/2	4 lams	36[2]
24F-ES/MSR	3-1/8	3-1/2	4 lams	36[2]
24F-ES/NPG	1-1/2	27	4 lams	NA[2]
ES11	1-1/2	7-1/2	2 lams	15
ES11/NPG	1-1/2	7-1/2	2 lams	15
ES12	1-1/2	7-1/2	2 lams	15
ES12/NPG	1-1/2	27	2 lams	54[2]

[1] The minimum width shall be permitted to be 1-1/2 inches when 24F-ES/NPG is trademarked as 20F-ES/CPG.

[2] The maximum depth shall not exceed the tabulated depth or a depth-to-width ratio of 12:1, whichever is smaller.

Table 2. Allowable Design Values for Nordic Lam Beams for Normal Duration of Load[1,2,3]

Symbol	Species Outer/ Core[4] (Bal or Unbal[5])	Bending About X-X Axis (Loaded Perpendicular to Wide Faces of Laminations)								Bending About Y-Y Axis (Loaded Parallel to Wide Faces of Laminations)						Axially Loaded		Fasteners	
		Extreme Fiber in Bending[6]		Compression Perpendicular to Grain		Shear Parallel to Grain[7]	Modulus of Elasticity[8]			Extreme Fiber in Bending[9]	Comp. Perpen-dicular to Grain	Shear Parallel to Grain[7]	Modulus of Elasticity[8]			Tension Parallel to Grain	Comp. Parallel to Grain	Specific Gravity for Dowel-Type Fastener Design	
		Bottom of Beam Stressed in Tension (Positive Bending)	Top of Beam Stressed in Tension (Negative Bending)	Ten. Face	Comp. Face		True	App-arent	Beam Stabi-lity				True	App-arent	Beam Stabi-lity			Top or Bottom Face	Side Face
		F_{bx}^+ (psi)	F_{bx}^- (psi)	$F_{c\perp x}$ (psi)		F_{vx} (psi)	$E_{x\ true}$ (10^6 psi)	$E_{x\ app}$ (10^6 psi)	$E_{x\ min}$ (10^6 psi)	F_{by} (psi)	$F_{c\perp y}$ (psi)	F_{vy} (psi)	$E_{y\ true}$ (10^6 psi)	$E_{y\ app}$ (10^6 psi)	$E_{y\ min}$ (10^6 psi)	F_t (psi)	F_c (psi)	SG	
1,350F$_b$-1.6E/ES1[10]	ES/ES (B)	1,350[11]	1,350[11]	450	450	250	1.7	1.6	0.85	NA	NA	NA	NA	NA	NA	NA	NA	0.41	0.41
20F-E8M1	ES/ES (B)	2,000	2,000	450	450	250	1.6	1.5	0.79	1050	315	175	1.5	1.4	0.74	800	1,000	0.41	0.41
20F-ES/CPG	ES/ES (B)	2,000	2,000	450	450	250	1.9	1.8	0.95	2,000	450	250	1.9	1.8	0.95	800	1,000	0.41	0.41
24F-E/ES1M1	ES/ES (B)	2,400	2,400	600[12]	600[12]	250	1.9	1.8	0.95	1,100	300	175	1.6	1.5	0.79	1,050	1,150	0.41	0.41
24F-ES/MSR	ES/ES (B)	2,400	2,400	600[12]	600[12]	250	1.9	1.8	0.95	1,100	300	175	1.6	1.5	0.79	1,050	1,150	0.41	0.41
24F-ES/NPG	ES/ES (B)	2,400	2,400	600[12]	600[12]	300	1.9	1.8	0.95	2,400	600[12]	300	1.9	1.8	0.95	1,600	2,300	0.46	0.46
Wet-use factor		0.8		0.53		0.875	0.833			0.8	0.53	0.875	0.833			0.8	0.73	see NDS	

(1) The combinations in this table are intended primarily for members stressed in bending due to loads applied perpendicular to the wide faces of the laminations. Allowable design values are tabulated, however, for loading both perpendicular and parallel to the wide faces of the laminations.

(2) The tabulated allowable design values are for normal duration of loading. For other durations of loading, see the applicable building code. The tabulated allowable design values are for dry conditions of use. For wet conditions of use, multiply the tabulated values by the wet-use factors shown at the bottom of the table.

(3) Referenced design values must be adjusted, as applicable, in accordance with Section 5.3 of the NDS.

(4) ES = Eastern spruce.

(5) The unbalanced (U) layup is intended primarily for simple-span applications and the balanced (B) layup is intended primarily for continuous or cantilevered applications.

(6) The values of F_{bx} are based on members 5-1/8 inches in width by 12 inches in depth by 21 feet in length. For members with a larger volume, F_{bx} shall be multiplied by a volume factor, $C_v = (5.125/b)^{1/10}\ (12/d)^{1/10}\ (21/L)^{1/10}$, where b is the beam width (in.), d is the beam depth (in.), and L is the beam length between the points of zero moment (ft).

(7) For non-prismatic members, members subject to impact or cyclic loading, or shear design of bending members at connections (2024 NDS 3.4.4.1 or 2018 and 2015 NDS 3.4.3.3), the F_{vx} and F_{vy} values shall be multiplied by a factor of 0.72.

(8) The tabulated E values include true E (also known as "shear-free E"), apparent E, and E for beam stability calculation (NDS 3.3.3.8). For calculating beam deflections, the tabulated E_{app} values shall be used unless the shear deflection is determined in addition to bending deflection based on the tabulated E_{true}. The axial modulus of elasticity, E_{axial} and $E_{axial\ min}$, shall be equal to the tabulated $E_{y\ true}$ and $E_{y\ min}$ values.

(9) The values of F_{by} are based on members 12 inches in depth. For depths less than 12 inches, F_{by} shall be permitted to be increased by multiplying by the flat use factor, $(12/d)^{1/9}$, where d is the beam depth in inches. When d is less than 3 inches, use the flat-use factor for 3 inches.

(10) This layup is limited to 1-1/2 inches in width and 7-1/8 inches through 15 inches in depth.

(11) The values of F_{bx} are based on members 1-1/2 inches in width by 12 inches in depth. For members with other depths, F_{bx} shall be multiplied by an adjustment factor of $(12/d)^{(1/9)}$ in lieu of the typical volume factor used for glulam, as shown in Footnote 6.

(12) The $F_{c\perp}$ value is applicable to glulam members made with manufactured lumber. Otherwise, the $F_{c\perp x}$ value shall be 560 psi.

Table 3. Allowable Design Values for Nordic Lam Columns for Normal Duration of Load[1,2]

Combination Symbol	Species[3]	Grade	All Loading				Axially Loaded			Bending about Y-Y Axis				Bending about X-X Axis		Fasteners
			Modulus of Elasticity[4]			Compression Perpendicular to Grain	Tension Parallel to Grain	Compression Parallel to Grain		Loaded Parallel to Wide Faces of Laminations				Loaded Perpendicular to Wide Faces of Laminations		Specific Gravity for Dowel-Type Fastener Design
										Bending[5]			Shear Parallel to Grain[6,7]	Bending[8]	Shear Parallel to Grain[6]	
							2 or More Lams	4 or More Lams	2 or 3 Lams	4 or More Lams	3 Lams	2 Lams		2 Lams to 15 in. Deep		
			$E_{x\,true}$, $E_{y\,true}$ or E_{axial} (10^6 psi)	$E_{x\,app}$ or $E_{y\,app}$ (10^6 psi)	$E_{x\,min}$, $E_{y\,min}$ or $E_{axial\,min}$ (10^6 psi)	$F_{c\perp}$ (psi)	F_t (psi)	F_c (psi)	F_c (psi)	F_{by} (psi)	F_{by} (psi)	F_{by} (psi)	F_{vy} (psi)	F_{bx} (psi)	F_{vx} (psi)	SG
ES 11	ES	C4	1.6	1.5	0.79	450	975	1,550	1,350	1,750	1,600	1,400	175	1,350[9]	250	0.41
ES 11/NPG	ES	NPG	1.6	1.5	0.79	450	975	1,550	1,350	1,750	1,600	1,400	175	1,350	250	0.41
ES 12	ES	1.9E6	1.9	1.8	0.95	600[10]	1,600	2,300	1,700	2,400	2,400	2,300	175	1,950[9]	250	0.46
ES 12/NPG	ES	NPG	1.9	1.8	0.95	600[10]	1,600	2,300	1,700	2,400	2,400	2,300	300	2,400	300	0.46
Wet-use factors			0.833			0.53	0.8	0.73		0.8			0.875	0.8	0.875	see NDS

(1) The tabulated allowable design values are for normal duration of loading. For other durations of loading, see applicable building code. The tabulated allowable design values are for dry conditions of use. For wet conditions of use, multiply the tabulated values by the factors shown at the bottom of the table.

(2) Referenced design values must be adjusted, as applicable, in accordance with Section 5.3 of the NDS.

(3) ES = Eastern spruce.

(4) The tabulated E values include Shear-free (true) modulus of elasticity ($E_{x\,true}$, $E_{y\,true}$, and E_{axial}), apparent modulus of elasticity ($E_{x\,app}$ and $E_{y\,app}$), and 5th percentile modulus of elasticity ($E_{x\,min}$, $E_{y\,min}$, and $E_{axial\,min}$). For column stability calculation (NDS 3.7.1), $E_{axial\,min}$ shall be used. For calculating the total deflection due to bending, the tabulated $E_{x\,app}$ or $E_{y\,app}$ values shall be used, or as an alternative, the true (shear-free) bending deflection shall be calculated using the tabulated $E_{x\,true}$ or $E_{y\,true}$, which shall be added to the calculated shear deflection to determine the total deflection due to bending.

(5) The values of F_{by} are based on members 12 inches in depth. For depths less than 12 inches, F_{by} shall be permitted to be increased by multiplying by the flat use factor, $(12/d)^{1/9}$, where d is the beam depth in inches. When d is less than 3 inches, use the size adjustment factor for 3 inches.

(6) For non-prismatic members, notched members, members subject to impact or cyclic loading, or shear design of bending members at connections (2024 NDS 3.4.4.1 or 2018 and 2015 NDS 3.4.3.3), the tabulated F_{vx} and F_{vy} values shall be multiplied by 0.72.

(7) The tabulated F_{vy} values are for members of 4 or more lams. The tabulated F_{vy} values shall be multiplied by a factor of 0.95 for 3 lams and 0.84 for 2 lams.

(8) The values of F_{bx} are based on members 5-1/8 inches in width by 12 inches in depth by 21 feet in length. For members with a larger volume, F_{bx} shall be multiplied by a volume factor, $C_v = (5.125/b)^{1/10}\,(12/d)^{1/10}\,(21/L)^{1/10}$, where b is the beam width (in.), d is the beam depth (in.), and L is the beam length between the points of zero moment (ft).

(9) The tabulated F_{bx} values are for members without special tension lams up to 15 inches in depth. If the member depth is greater than 15 inches without special tension lams, the tabulated F_{bx} values must be multiplied by a factor of 0.88. If special tension lams are used, the tabulated F_{bx} values are permitted to be increased by a factor of 1.18 regardless of the member depth provided that the increased F_{bx} value does not exceed 2,400 psi. This factor shall be cumulative with the volume factor, C_v, specified in Footnote 8.

(10) The $F_{c\perp}$ value is applicable to glulam members made with manufactured lumber. Otherwise, the $F_{c\perp}$ value shall be 560 psi for ES 12 and ES 12/NPG.

APA – The Engineered Wood Association is an approved national standards developer accredited by American National Standards Institute (ANSI). APA publishes ANSI standards and Voluntary Product Standards for wood structural panels and engineered wood products. APA is an accredited certification body under ISO/IEC 17065 by Standards Council of Canada (SCC), an accredited inspection agency under ISO/IEC 17020 by ANSI National Accreditation Board (ANAB), and an accredited testing organization under ISO/IEC 17025 by ANAB. APA is also an approved Product Certification Agency, Testing Laboratory, Quality Assurance Entity, Validation Entity, and Product Evaluation Entity by the State of Florida, and an approved testing laboratory by City of Los Angeles.

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