# APA PRODUCT REPORT®

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## Nordic Lam™
## Nordic Structures

**PR-L294**

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Products: Nordic Lam™

Nordic Structures
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1. Basis of the product report:
   - 2015, 2012 and 2009 International Building Code (IBC): Sections 104.11 Alternative materials and 2303.1.3 Structural glued-laminated timber
   - 2015 International Residential Code (IRC): Sections R104.11 Alternative materials, and R502.1.3, R602.1.3, and R802.1.2 Structural glued-laminated timber
   - 2012 and 2009 IRC: Sections R104.11 Alternative materials, and R502.1.5, R602.1.2, and R802.1.4 Structural glued-laminated timber
   - ASTM D3737-12 recognized by the 2015 IBC and IRC
   - ASTM D3737-08 and D3737-07 recognized by the 2012 IBC and IRC, and 2009 IBC and IRC, respectively
   - ANSI A190.1-2012 recognized by the 2015 IBC and IRC
   - ANSI/AITC A190.1-2007 recognized by the 2012 IBC and IRC, and 2009 IBC and IRC
   - 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 a Black Spruce structural glued laminated timber (glulam) manufactured in accordance with 1,350$F_b$-1.6E/ES1, 20F-E8M1, 20F-ES/CPG, 24F-E/ES1M1, 24F-ES/MSR, 24F-ES/NPG, ES11, ES11/NPG, ES12, and ES12/NPG layup combinations developed in accordance with the principle of ASTM D3737. 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 12-7/8 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/data/files/datasheet/file/N-U221BeamsandHeadersJune2013.pdf), 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/data/files/datasheet/file/N-U231ColumnsJune2013.pdf), and APA Data File: *Design of Structural Glued Laminated Timber Columns*, Form Y240 (see link above), as applicable.

4. Product installation:
   Nordic Lam beams and columns shall be installed in accordance with the recommendations provided by the manufacturer (www.nordic.ca/data/files/datasheet/file/N-U121NordicLamApril2014.pdf) and APA Technical Note: 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 Note: Field Notching and Drilling of Glued Laminated Timber Beams, Form S560 (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:
Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer (see link above). Procedures specified in Chapter 16 of the 2015 NDS shall be permitted for use in designing glulams exposed to fire up to 2 hours. 1,350$F_b$-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 Sections R302.13 of the 2015 IRC and R501.3 of the 2012 IRC, *Fire Protection of Floors*.

Nordic Lam has been tested in accordance with ASTM E84 and meets the Class B rating for flame spread index (26 – 75) and smoke-developed index (0 – 450).

6. Limitations:
   a) Nordic Lam beams and columns shall be designed in accordance with the code using the 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 APA *Glulam Layup Combinations*, Form Y117 SUP (see link above) or proprietary Nordic Lam manufacturing specifications documented in the in-plant manufacturing standard approved by APA.
   d) Nordic Lam is produced at the Nordic Engineered Wood, 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.) |
|---|---|---|---|---|
| 1,350$F_b$-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 | 20 | 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 | 20 | 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]

| Symbol | Species Outer/ Core[3] (Bal or Unbal[4]) | 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[5] | | Compression Perpendicular to Grain | | Shear Parallel to Grain[6] | Modulus of Elasticity[7] | | | Extreme Fiber in Bending[8] | Comp. Perpen-dicular to Grain | Shear Parallel to Grain[6] | Modulus of Elasticity[7] | | | 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 | |
| 1,350$F_b$-1.6E/ES1[9] | ES/ES (B) | 1,350[10] | 1,350[10] | 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[11] | 600[11] | 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[11] | 600[11] | 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[11] | 600[11] | 300 | 1.9 | 1.8 | 0.95 | 2,400 | 600[11] | 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) ES = Eastern spruce.

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

(5) 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).

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

(7) 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.

(8) 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 size 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.

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

(10) 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 a size factor of $(12/d)^{(1/9)}$.

(11) 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 Nordic Lam Columns for Normal Duration of Load[1]

| Combination Symbol | Species[2] | Grade | All Loading | | | | Axially Loaded | | | Bending about Y-Y Axis | | | | Bending about X-X Axis | | Fasteners |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Modulus of Elasticity[3] | | | 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[4] | | | Shear Parallel to Grain[5,6] | Bending[7] | Shear Parallel to Grain[5] | |
| | | | | | | | 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 | | |
| | | | $E_{axial}$ ($10^6$ psi) | 0.95 $E_{axial}$ ($10^6$ psi) | $E_{axial\ min}$ ($10^6$ 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[8] | 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[9] | 1,600 | 2,300 | 1,700 | 2,400 | 2,400 | 2,300 | 175 | 1,950[8] | 250 | 0.46 |
| ES 12/NPG | ES | NPG | 1.9 | 1.8 | 0.95 | 600[9] | 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) ES = Eastern spruce.

(3) The tabulated E values include axial modulus of elasticity ($E_{axial}$), 0.95 $E_{axial}$, and E for column stability calculation ($E_{axial\ min}$, NDS 3.7.1). For calculating column deflections due to lateral loads, the tabulated 0.95 $E_{axial}$ values shall be used unless the shear deflection is determined in addition to bending deflection based on the tabulated $E_{axial}$.

(4) 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 size 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.

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

(6) 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.

(7) 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).

(8) When the member depth is greater than 15 inches, the tabulated $F_{bx}$ values shall be multiplied by a factor of 0.88.

(9) 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.

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