

FOREX Laminated Veneer Lumber
Forex Amos

PR-L318

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Product: Forex LVL

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1. Basis of the product report:
 - 2018 and 2015 International Building Code (IBC): Sections 104.11 Alternative materials and 2303.1.10 Structural composite lumber
 - 2012 IBC: Sections 104.11 Alternative materials and 2303.1.9 Structural composite lumber
 - 2018 and 2015 International Residential Code (IRC): Sections R104.11 Alternative materials, and R502.1.5, R602.1.5, and R802.1.4 Structural composite lumber
 - 2012 IRC: Section R104.11 Alternative materials, and 2012 IRC Sections R502.1.7, R602.1.4, and R802.1.6 Structural composite lumber
 - 2015 ANSI/AWC and 2008 ANSI/AF&PA Special Design Provisions for Wind and Seismic (SDPWS)
 - ASTM D5456-14b, D5456-13, and D5456-09 recognized by the 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
 - APA Reports T2006P-54, T2007P-13A, T2007P-72, T2008P-23, T2008P-34, T2017P-02, T2017P-08, and T2017P-11, and other qualification data
2. Product description:

Forex laminated veneer lumber (LVL) is made with aspen veneers in accordance with the in-plant manufacturing standard approved by APA. Forex 2580Fb - 1.55E LVL is available in thicknesses from 1-1/4 inches to 1-3/4 inches, widths of 3-1/2 inches to 24 inches, and lengths up to 60 feet. Forex 2700Fb - 1.8E, 3000Fb - 1.9E, and 3100Fb - 2.0E LVL's are available in thicknesses from 1-1/2 inches to 5-1/4 inches, widths of 3-1/2 inches to 24 inches, and lengths up to 60 feet.
3. Design properties:

Table 1 lists the Allowable Stress Design properties for Forex LVL. Table 2 lists the equivalent specific gravities for fastener design of Forex LVL. Table 3 lists the allowable nail spacing for Forex LVL. The allowable spans for Forex LVL shall be in accordance with the recommendations provided by the manufacturer.
4. Product installation:

Forex LVL shall be installed in accordance with the recommendations provided by the manufacturer. Permissible details and allowable hole sizes shall be in accordance with the recommendations provided by the manufacturer.
5. Fire-rated assemblies:

The provisions of 2018 and 2015 IBC Section 722 Calculated fire resistance, and 2012 IBC Section 722.6.3 Design of fire-resistant exposed wood members shall be applicable to Forex LVL. Fire-rated assemblies shall be constructed in accordance with the recommendations provided by APA Design/Construction Guide: *Fire-Rated Systems*, Form W305 (www.apawood.org/resource-library), and the manufacturer.
6. Limitations:
 - a) Forex LVL shall be designed in accordance with the code using the design properties specified in this report.

- b) Forex LVL is limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16 percent.
- c) Forex LVL is produced at the Forex facility in Amos, Quebec, Canada under a quality assurance program audited by APA.
- d) This report is subject to re-examination in one year.

7. Identification:

Forex LVL described in this report is identified by a label bearing the manufacturer's name and/or trademark, the APA assigned plant number (1118), the LVL grade, the APA logo, the report number PR-L318, and a means of identifying the date of manufacture.

Table 1. Allowable Stress Design Properties for Forex LVL ^(a,b)

Property		Design Stress (psi)			
		2580Fb - 1.55E apparent 1.60E true	2700Fb - 1.8E apparent 1.9E true	3000Fb - 1.9E apparent 2.0E true	3100Fb - 2.0E apparent 2.1E true
Bending (F_b) ^(c,d)	Joist	2,580	2,700	3,000	3,100
Apparent Modulus of Elasticity (E_{app}) ^(e)	Joist	1.55×10^6	1.8×10^6	1.9×10^6	2.0×10^6
True (Shear-Free) Modulus of Elasticity (E_{true}) ^(f)	Joist	1.60×10^6	1.9×10^6	2.0×10^6	2.1×10^6
Tension parallel to grain (F_t) ^(g)		1,780	2,000	2,000	2,000
Horizontal shear (F_v)	Joist	250	250	250	290
	Plank	165	165	165	180
Compression parallel ($F_{c }$)		2,375	2,375	2,375	2,600
Compression perpendicular ($F_{c\perp}$)	Joist	510	510	510	520
	Plank	260	200	200	200

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf = 4.448 N, 1 psi = 6.9 kPa.

- (a) The tabulated values are design values for normal duration of load. All values, except for E and $F_{c\perp}$, are permitted to be adjusted for other load durations as permitted by the code. The design stresses are limited to conditions in which the average moisture content is less than 16 percent at maximum.
- (b) Joist = load parallel to glueline, plank = load perpendicular to glueline.
- (c) Tabulated bending stress (F_b) may be increased by 4 percent when the member qualifies as a repetitive member as defined in the NDS.
- (d) The tabulated values are based on a reference depth of 12 inches. For other depths, when loaded edgewise, the allowable bending stress (F_b) shall be modified by $(12/d)^{0.25}$ for Forex 2580Fb - 1.55E, and $(12/d)^{0.16}$ for Forex 2700Fb - 1.8E, 3000Fb - 1.9E, and 3100Fb - 2.0E LVL, as shown in the following table, where d = member depth in inches. For depths less than 3-1/2 inches, the factor for the 3-1/2-inch depth shall be used.

Depth (in.)	3-1/2	5-1/2	7-1/4	9-1/4	9-1/2	11-1/4	11-7/8	14	16	18	24
2580Fb - 1.55E apparent 1.60E true	1.36	1.22	1.13	1.07	1.06	1.02	1.0	0.96	0.93	0.90	0.84
Other grades	1.22	1.13	1.08	1.04	1.04	1.01	1.0	0.98	0.96	0.94	0.90

- (e) Apparent modulus of elasticity. The deflection for a simply-supported beam under uniform load shall be calculated using the following equation:

$$\delta = \frac{270 \omega L^4}{E_{apparent} b h^3}$$

Where: δ = Estimated deflection, inches
L = span, feet
b = beam width, inches

ω = uniform load, plf
 $E_{apparent}$ = tabulated apparent modulus of elasticity, psi
h = beam depth, inches

- (f) True (shear-free) modulus of elasticity. When calculating deflection, both bending and shear deformations must be included. The deflection for a simply-supported beam under uniform load shall be calculated using the following equation:

$$\delta = \frac{270 \omega L^4}{E_{true} b h^3} + \frac{28.8 \omega L^2}{E_{true} b h}$$

Where: δ = Estimated deflection, inches
L = span, feet
b = beam width, inches

ω = uniform load, plf
 E_{true} = tabulated true modulus of elasticity, psi
h = beam depth, inches

- (g) The tabulated values are based on a reference length of 20 feet. For lengths greater than 20 feet, the allowable tensile stress shall be modified by $(20/L)^{0.146}$, where L = member length in feet.

Table 2. Fastener Design for Forex LVL

GRADE	EQUIVALENT SPECIFIC GRAVITY (S.G.)					
	NAILS				BOLTS	
	Withdrawal Load		Lateral Load		Lateral Load	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Installed in Face	
					Parallel to Grain	Perpendicular to Grain
2580Fb - 1.55E apparent 1.60E true	Hemlock/ fir North (0.46)	Red pine (0.44)	Spruce/ pine/fir (0.42)	Hemlock/fir North (0.46)	(0.33)	Western white pine (0.40)
2700Fb - 1.8E apparent 1.9E true	Western white pine (0.40)	Western white pine (0.40)	Spruce/ pine/fir (0.42)	Hemlock/fir North (0.46)	(0.33)	Western white pine (0.40)
3000Fb - 1.9E apparent 2.0E true	Western white pine (0.40)	Western white pine (0.40)	Spruce/ pine/fir (0.42)	Hemlock/fir North (0.46)	(0.33)	Western white pine (0.40)
3100Fb - 2.0E apparent 2.1E true	Western white pine (0.40)	Western white pine (0.40)	Spruce/ pine/fir (0.42)	Hemlock/fir North (0.46)	Hemlock/fir (0.43)	Hemlock/fir (0.43)

Table 3. Minimum Allowable Nail Spacings for Forex LVL ^(a,b,c)

Connector Size	Nails Installed in the Narrow Face ^(d,e,f)	
	On-Center Spacing (inches)	End Distance (inches)
8d box (0.113" x 2-1/2") and common (0.131" x 2-1/2") nail	3	2-1/2
10d box (0.128" x 3") and common (0.148" x 3") nail	3	2-1/2
16d sinker (0.148" x 3-1/4") and 12d common (0.148" x 3-1/4") nail	3	2-1/2
16d common (0.162" x 3-1/2") nail ^(g)	6	3

For SI: 1 inch = 25.4 mm.

- (a) The minimum on-center spacing permitted for nails installed in the wide face of Forex LVL is the same as that permitted by the applicable code for solid-sawn lumber.
- (b) Fastener sizes and closest on-center spacing not specifically described above are beyond the scope of this report.
- (c) Edge distance shall be sufficient to prevent splitting.
- (d) Unless otherwise specified, nails installed parallel to the gluelines on the narrow face of material shall be at least 1-1/4 inches thick and 3-1/2 inches wide.
- (e) Multiple rows of nails are allowed in the narrow face of members with a minimum thickness of 1-3/4 inches. A minimum spacing of 1/2 inch is required between rows.
- (f) Multiple rows must be offset 1/2 inch or more from each other and staggered around the centerline.
- (g) The minimum on-center nail spacing is permitted to be reduced to 4 inches when nailing through bottom wall plate and sheathing (maximum 1-3/8-inch penetration).

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