

VERSA-LAM[®] LVL**PR-L266****Boise Cascade Wood Products, LLC**

Revised March 1, 2024

Product: 1.8E 2650/1650, 1.9E 2750/1825, and 2.1E 3100/2150 VERSA-LAM[®] LVL
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1. Basis of the product report:
 - 2021, 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
 - 2021, 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: Sections R104.11 Alternative materials, and R502.1.7, R602.1.4, and R802.1.6 Structural composite lumber
 - ASTM D5456-18, ASTM D5456-14b, ASTM D5456-13, and D5456-09 recognized by the 2021 IB and IRC, 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
 - APA Reports T97P-26, T98P-10, T2000P-24, T2002P-12, T2002P-15, T2003P-81A, T2004P-09, T2004P-25, T2004P-26, T2004P-48, T2005P-25, T2007P-08, T2007P-09, T2007P-10, T2007P-59, T2007P-98, T2016P-41A, T2017P-33, and T2021P-14A, and other qualification data
2. Product description:

VERSA-LAM[®] LVL is made with veneer sheets of various species and grades in accordance with the in-plant manufacturing standards approved by APA. VERSA-LAM LVL is available in thicknesses from 3/4 inch to 3-1/2 inches, widths of 3-1/2 inches to 48 inches, and lengths up to 80 feet.
3. Design properties:

Table 1 lists the design properties, Table 2 lists the equivalent specific gravities for connection design, and Table 3 lists the allowable fastener spacing for VERSA-LAM LVL. The allowable loads for VERSA-LAM LVL shall be in accordance with the recommendations provided by the manufacturer (www.bc.com/ews/).
4. Product installation:

VERSA-LAM 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 2021, 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 VERSA-LAM 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) VERSA-LAM LVL shall be designed in accordance with the code using the design properties specified in this report.

- b) VERSA-LAM LVL is limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16%.
- c) The VERSA-LAM LVL grades are produced at Boise Cascade's facility in Thorsby, Alabama under a quality assurance program audited by APA.
- d) This report is subject to re-examination in one year.

7. Identification:

VERSA-LAM LVL described in this report is identified by a label bearing the manufacturer's name and/or trademark, the APA assigned plant number (1086), the LVL grade, the APA logo, the report number PR-L266, and a means of identifying the date of manufacture.

Identification may include one or more of the following:

VERSA-LAM® LVL, Boise-Cascade, or Boise Cascade Wood Products, LLC.

Table 1. Design Properties (Allowable Stress Design) for VERSA-LAM LVL (psi)^(a,b)

True E		Apparent E		Flexural Stress, F _b ^(c,d)		Tension Parallel to Grain, F _t ^(e)	Comp. Parallel to Grain, F _c	Compression Perpendicular to Grain, F _{c⊥}		Horizontal Shear, F _v	
Product Grade	E (10 ⁶ psi) ^(g)	Product Grade	E (x10 ⁶ psi) ^(f)	Joist	Plank			Perp. to Narrow Face (Plank)	Parallel to Narrow Face (Joist)	Parallel to Narrow Face (Plank)	Perp. to Narrow Face (Joist)
1.8E 2650/1650	1.8	1.7 2650	1.7	2,650	2,400	1,650	3,000	610	750	190	285
1.9E 2750/1825	1.9	1.8 2750	1.8	2,750	2,500	1,825	3,000	610	750	190	285
2.1E 3100/2150	2.1	2.0 3100	2.0	3,100	2,800	2,150	3,000	610	750	190	285

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⊥}, are permitted to be adjusted for other load durations as permitted by the code. The design stresses are limited to conditions in which the maximum moisture content is less than 16%.
- (b) Joist = load parallel to glue-line; Plank = load perpendicular to glue-line.
- (c) Tabulated flexural stress (F_b) may be increased by 4% when the member qualifies as a repetitive member as defined in the NDS.
- (d) The tabulated plank values require no depth modification. The tabulated joist 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)^{1/3} for 1.8E, 1.9E, and 2.1E VERSA-LAM, as shown in the following table. 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	11-1/4	12	16	18	20	24
1.8E, 1.9E, and 2.1E VERSA-LAM	Multiply by	1.15	1.09	1.06	1.03	1.01	1.0	0.97	0.96	0.94	0.93

- (e) The tabulated values are based on a reference length of 4 feet. For other lengths, the allowable tensile stress shall be modified by (4/L)^{1/8} for all grades of VERSA-LAM LVL, where L = length in feet. For lengths less than 4 feet, use the allowable tension stresses in Table 1 unadjusted.
- (f) The MOE values given are the apparent modulus of elasticity and include the effects of shear deformations. When calculating deflection, only the bending deformations need be included and the second term of the equation in footnote (g) may be ignored.
- (g) The MOE values given are the true (shear-free) modulus of elasticity. When calculating deflection, both bending and shear deformations must be included. The deflection equation for a simply-supported beam under uniform load is:

$$\delta = \frac{270wL^4}{Eb^3} + \frac{28.8wL^2}{Eb}$$

Where:

δ	=	Estimated total deflection, inches	w	=	uniform load, plf
L	=	span, feet	E	=	tabulated <u>true</u> modulus of elasticity, psi
b	=	beam width, inches	h	=	beam depth, inches

Table 2. Fastener Details for VERSA-LAM LVL

LVL Grade	Equivalent Specific Gravity (S.G.)					
	Nails and Wood Screws				Bolts and Lag Screws	
	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
1.8E, 1.9E and 2.1E VERSA-LAM	Hemlock/ fir (0.43)	Douglas- fir/ larch (0.50)	Douglas- fir/ larch (0.50)	Douglas- fir/ larch (0.50)	Douglas- fir/ larch (0.50)	Douglas-fir/ larch (0.50)

Table 3. Allowable Fastener Spacing for Installation Parallel to the Glue Line in VERSA-LAM LVL^(a)

Minimum Member Size (in.)	Connector Size	Nails Installed in the Narrow Face
		On-Center Spacing (in.)
3/4 x 3-1/2	10d box and common nails	6
	16d sinker and 12d common nails	6
	14 gage staples	6
1-3/4 x 5-1/2	10d box and common nails	4
	16d sinker and 12d common nails	4
	14 gage staples	4
	16d common nails	8

For SI: 1 inch = 25.4 mm

^(a) The minimum on-center spacing permitted for nails installed in the wide face of VERSA-LAM LVL, i.e., perpendicular to the glue line, is the same as that permitted by the applicable code for solid-sawn lumber.

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