

Pacific Woodtech Laminated Veneer Lumber PR-L233
Pacific Woodtech Corporation Revised June 8, 2020

Products: Laminated veneer lumber structural building components
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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: Section 104.11 Alternative materials and Section 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: Sections R104.11 Alternative materials, and R502.1.7, R602.1.4, and R802.1.6 Structural composite lumber
 - ASTM D5456-14b, ASTM D5456-13, and ASTM D5456-09 recognized by the 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
 - ASTM D7672-14 and ASTM D7672-12 recognized by the 2018 IBC and IRC, and the 2015 IBC and IRC, respectively
 - 2015 ANSI/AWC Special Design Provisions for Wind and Seismic (SDPWS) recognized by the 2018 and 2015 IBC
 - 2008 ANSI/AF&PA SDPWS recognized by the 2012 IBC.
 - APA Reports T99P-18, T99P-19, T99P-20, T2001P-52, T2001P-76, T2002P-31, T2003P-50, T2004P-1, T2006P-10, T2006P-88, T2008P-47, T2009P-45, T2011P-48, T2012P-32, T2015P-23, T2018P-06, T2018P-07, T2019P-52, and T2020P-04, and other qualification data
2. Product description:

Pacific Woodtech LVL is pressed into billets that are approximately 48 inches in width, 3/4 to 3-1/2 inches in thickness, and up to approximately 66 feet in length. LVL billets are ripped into products that are 1-3/4 to 48 inches in depth. Products up to 7 inches in thickness are fabricated by means of a secondary face-bonding process. Pacific Woodtech 1.6E (True) LVL shall be permitted for use as rim board in thicknesses of 1-1/4, 1-1/2 and 1-3/4 inches.
3. Design properties:

The structural design provisions for wood construction provided in the building code are applicable to Pacific Woodtech LVL unless noted otherwise in this report. Table 1 lists Allowable Stress Design reference properties. Table 2 lists the allowable loads for Pacific Woodtech LVL rim board. Minimum spacings for fasteners installed in the edge and face of a member are provided in Table 3. Table 4 lists the equivalent specific gravities for connection design. The allowable spans for Pacific Woodtech LVL shall be in accordance with the recommendations provided by the manufacturer (<https://pacificwoodtech.com/documents/pwlv1-user-guide/>).
4. Product installation:

Pacific Woodtech LVL shall be installed in accordance with the recommendations provided by the manufacturer (see link above).

5. Fire-rated assemblies:
The provisions of Section 722.6 of the 2018, 2015, and 2012 IBC, Calculated Fire Resistance, shall be applicable to Pacific Woodtech 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 (see link above). Fire-rated assemblies for Pacific Woodtech LVL rim board shall be constructed in accordance with APA Product Report PR-S262.
6. Limitations:
 - a) Pacific Woodtech LVL shall be designed in accordance with the code using the design properties specified in this report.
 - b) Pacific Woodtech LVL is limited to dry service conditions where the average moisture content of sawn lumber is less than 16 percent.
 - c) Pacific Woodtech LVL is produced at the Pacific Woodtech Corporation manufacturing plant located in Burlington, Washington, under a quality control program audited by APA.
 - d) This report is subject to re-examination in one year.
7. Identification:
Pacific Woodtech LVL is sold under the Pacific Woodtech and various private-label brands. Regardless of the brand applied, all products are identified by a label bearing the manufacturer's name (Pacific Woodtech) and/or trademark, the APA assigned plant number (1047), the LVL grade, the APA logo, this report number (PR-L233), and a means of identifying the date of manufacture.

Table 1. Allowable Stress Design Reference Properties for Pacific Woodtech LVL^(a)

| True E | | Apparent E | | Beam ^(b) | | | Plank ^(c) | | | Axial | |
|--------|---|------------|---|--|----------------------|-----------------------|--|----------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| Grade | MOE (10 ⁶ psi) ^{(d)(f)} | Grade | MOE (10 ⁶ psi) ^{(e)(f)} | F _b (psi) ^{(g)(i)} | F _v (psi) | F _{c⊥} (psi) | F _b (psi) ^{(h)(i)} | F _v (psi) | F _{c⊥} (psi) ⁽ⁱ⁾ | F _t (psi) ^(k) | F _c (psi) ^(l) |
| 1.6E | 1.6 | 1.5E | 1.5 | 2250 | 230 | 750 | 2250 | 150 | 650 | 1500 | 1950 |
| 1.9E | 1.9 | 1.8E | 1.8 | 2750 | 285 | 850 | 2750 | 150 | 650 | 1850 | 2450 |
| 2.1E | 2.1 | 2.0E | 2.0 | 2900 | 285 | 850 | 2900 | 150 | 650 | 2100 | 2750 |
| 2.1E | 2.1 | 2.0E | 2.0 | 3100 | 285 | 850 | 3100 | 150 | 650 | 2100 | 2750 |
| 2.3E | 2.3 | 2.2E | 2.2 | 3100 | 285 | 850 | 3100 | 150 | 650 | 2350 | 3050 |
| 2.5E | 2.5 | 2.4E | 2.4 | 3550 | 285 | 850 | 3550 | 150 | 650 | 2600 | 3400 |

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 apply to protected, dry service conditions. Except for modulus of elasticity (MOE) and compression perpendicular to grain (F_{c⊥}), the tabulated values are permitted to be adjusted for duration of load as provided in the code.
- ^(b) Beam values apply to members loaded and supported on faces showing the narrow edge of all veneers, typically the narrow faces of the member.
- ^(c) Plank values apply to members loaded and supported on faces showing the face of one veneer, typically the wide faces of the member.
- ^(d) The tabulated MOE values are the apparent modulus of elasticity and include the effects of shear deflection. When calculating deflection, only the bending deflection needs to be included. The deflection equation for a simple-span beam under uniform load is:

$$\delta = \frac{270 wL^4}{E_{\text{apparent}}bh^3}$$

where:

| | | |
|--|--|---|
| | δ = Estimated total deflection, inches | w = uniform load, plf |
| | L = span, feet | E _{apparent} = tabulated apparent modulus of elasticity, psi |
| | b = beam width, inches | h = beam depth, inches |

- ^(e) The tabulated MOE values are the shear-free modulus of elasticity. When calculating deflection, both bending and shear deflections must be included. The deflection equation for a simple-span beam under uniform load is:

$$\delta = \frac{270 wL^4}{E_{\text{true}}bh^3} + \frac{28.8wL^2}{E_{\text{true}}bh}$$

where:

| | | |
|--|--|---|
| | δ = Estimated total deflection, inches | w = uniform load, plf |
| | L = span, feet | E _{true} = tabulated true modulus of elasticity, psi |
| | b = beam width, inches | h = beam depth, inches |

- ^(f) Coefficient of variation of modulus of elasticity, COV_E = 0.10.
- ^(g) Flexural stress, F_b, for the beam orientation is based on a reference depth of 12 inches. For other depths, multiply by a size factor of (12/d)^{1/5}, where d is the depth in inches. For depths less than 1-3/4 inches, multiply by 1.47.
- ^(h) Flexural stress, F_b, for the plank orientation is based on a reference depth of 1-3/4 inches. For other depths, multiply by a size factor of (1.75/d)^{1/3}, where d is the depth in inches. For depths less than 1-3/4 inches, multiply by 1.00.
- ⁽ⁱ⁾ Flexural stress, F_b, values are permitted to be increased by 4 percent for repetitive members as provided by the code.
- ^(j) The tabulated compressive stress perpendicular to grain (F_{c⊥}) value is based on the average stress at the proportional limit or 0.04-in. deformation, whichever is less.
- ^(k) Tension parallel to grain, F_t, is based on a reference gage length of 4 feet. For longer lengths, multiply by a length factor of (4/L)^{1/10}, where L is the length in feet.
- ^(l) Compression parallel to grain, F_c.

Table 2. 1-1/4, 1-1/2, and 1-3/4-inch Rim Board Allowable Loads^{(a)(b)(c)(d)}

| True E (10 ⁶ psi) | Apparent E (10 ⁶ psi) | Minimum Thickness (in.) | Depth (in.) | Vertical Load Capacity | | Lateral Load Capacity ^(e) (plf) | Deck Ledger Connection ^(f) (1/2" dia. lag screw) (lbf) | Deck Ledger Connection ^(f) (1/2" dia. bolt) (lbf) | Deck Ledger Connection ^(f) (1/2" dia. bolt w/ air gap) (lbf) |
|---------------------------------|-------------------------------------|----------------------------|----------------|------------------------|-------------------------|---|---|--|---|
| | | | | Uniform Load (plf) | Concentrated Load (lbf) | | | | |
| 1.6 | 1.5 | 1-1/4 | 11-7/8 | 4,250 | 3,760 | 200 | 550 | 550 | 350 |
| | | | 14 | 3,550 | 3,550 | | | | |
| | | | 16 | 2,900 | 2,900 | | | | |
| | | 1-1/2 | 11-7/8 | 6,480 | 4,500 | 250 | 550 | 550 | 615 |
| | | | 14 | 5,600 | 4,500 | | | | |
| | | | 16 | 4,800 | 4,500 | | | | |
| | | | 18 | 3,900 | 2,700 | | | | |
| | | | 20 | 3,200 | 2,700 | | | | |
| | | | 24 | 2,250 | 2,250 | | | | |
| | | 1-3/4 | 11-7/8 | 7,560 | 5,200 | 250 | 675 | 725 | 615 |
| | | | 14 | 6,900 | 5,200 | | | | |
| | | | 16 | 6,200 | 5,200 | | | | |
| | | | 18 | 5,500 | 4,200 | | | | |
| | | | 20 | 4,800 | 4,200 | | | | |
| | | | 24 | 3,500 | 3,500 | | | | |

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

- ^(a) The design loads given in this table are for rim boards installed in accordance with the manufacturer's recommendations.
- ^(b) Tabulated design values are based on dry conditions of use, in which the environmental conditions (temperature and relative humidity) will result in an average equilibrium moisture content (EMC) of sawn lumber of less than 16%. Applications where the EMC will equal or exceed 16% are outside the scope of this report.
- ^(c) All design values are applicable to the normal load duration (10 years) for wood products, except for the lateral load capacity, which is based on the short-term load duration (10 minutes). Design values shall be adjusted for other load durations in accordance Section 2.3.2 of the NDS except the uniform vertical load and concentrated vertical load are not permitted to be increased for any load durations shorter than the normal load duration (10 years).
- ^(d) Other design values are as provided for 1.6E grade Pacific Woodtech LVL in Table 1.
- ^(e) Toe-nailed connections are not limited by the 150 lbf/ft lateral load capacity noted for Seismic Design Categories D, E and F in Section 4.1.7 of the 2008 and 2015 SDPWS.
- ^(f) Lag screw connections shall be installed following the manufacturer's recommendations.

Table 3. Minimum Spacing and Distance for Fasteners Installed into Edge of Pacific Woodtech LVL

| Nominal LVL Thickness | Orientation | Nail Size ^(b) | Nail Diameter (in.) | Nail Length (in.) | Minimum End Distance (in.) | Minimum Nail Spacing ^(b) (in.) | | Maximum Nail Penetration ^(c) (in.) |
|-----------------------|---------------------|--------------------------|---------------------|-------------------|----------------------------|---|------------------|---|
| | | | | | | Single Row | Double Row | |
| Less than 1-1/2 in. | Edge | 8d & smaller | 0.131 | 2.5 | 2-1/2 | 3 | NA | 2.25 |
| | | 10d & 12d | 0.148 | 3.25 | 2-1/2 | 4 | | 2.5 |
| | | 16d | 0.162 | 3.5 | 3-1/2 | 5 | | 2 |
| | Face ^(d) | 12d & smaller | 0.148 | 3.25 | 1-1/2 | 3 | 3 | |
| | | 16d | 0.162 | 3.5 | 1-1/2 | 5 | 5 | |
| | | | | | | | | |
| 1-1/2 in. and greater | Edge | 8d & smaller | 0.131 | 2.5 | 2-1/2 | 3 | 4 | 2.25 |
| | | 10d & 12d | 0.148 | 3.25 | 3-1/2 ^(e) | 4 | 5 | 2.5 |
| | | 16d | 0.162 | 3.5 | 3-1/2 | 5 | 6 ^(f) | 2 |
| | Face ^(d) | 12d & smaller | 0.148 | 3.25 | 1-1/2 | 3 | 3 | |
| | | 16d | 0.162 | 3.5 | 1-1/2 | 5 | 5 | |
| | | | | | | | | |

For SI: 1 inch = 25.4 mm

- (a) Edge distance shall be sufficient to prevent splitting.
- (b) Nail sizes and closest on-center spacing not specifically described in this table are outside the scope of this report.
- (c) Penetration length includes the nail tip.
- (d) Tabulated closest on-center spacing for face orientation is applicable to nails that are installed in rows parallel to the grain (length) of the LVL. For nails installed in rows perpendicular to the direction of grain (width/depth) of the LVL, the closest on-center spacing for face orientation shall be sufficient to prevent splitting of the LVL.
- (e) Minimum end distance is permitted to be reduced to 2-1/2 in. for single row nailing.
- (f) Minimum nail spacing may be reduced to 5 in. when LVL is 1-3/4 in. or thicker.

Table 4. Equivalent Specific Gravity for Connection Design

| Connection Type | Face | Edge |
|-------------------|------|-------|
| Nail – Withdrawal | 0.50 | 0.47 |
| Nail – Lateral | 0.50 | 0.50 |
| Bolt – Lateral | 0.50 | N. A. |

Face: member faces showing the face of one veneer, typically the wide faces of the member

Edge: member faces showing the narrow edge of all veneers, typically the narrow faces of the member

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