PRODUCT REPORT®

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Pacific Woodtech Laminated Veneer Lumber **PR-L233(C)**
Pacific Woodtech Corporation Revised September 8, 2021

Products: Laminated veneer lumber structural building components
Pacific Woodtech Corporation, 1850 Park Lane, Burlington, Washington 98233
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1. Basis of the product report:
   - 2015 National Building Code of Canada (NBCC): Clause 1.2.1.1 of Division A and Clauses 4.1, 4.3.1.1, and 9.23 of Division B
   - CSA O86-14 (Reprinted May 2016) Engineering Design in Wood recognized in the 2015 NBCC
   - ASTM D5456-14b recognized in CSA O86-14
   - ASTM D7672-19 Standard Specification for Evaluating Structural Capacities of Rim Board Products and Assemblies
   - 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, T2018P-09, T2019P-52, and T2020P-04, and other qualification data

2. Product description:
   Pacific Woodtech LVL is pressed into billets that are approximately 1,219 mm (48 inches) in width, 19 to 89 mm (3/4 to 3-1/2 inches) in thickness, and up to approximately 20 m (66 feet) in length. LVL billets are ripped into products that are 44 to 1,219 mm (1-3/4 to 48 inches) in depth. Products up to 178 mm (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 32, 38 and 44 mm (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 Limit States Design (LSD) properties. Table 2 lists the factored resistances and prescribed nail size and spacing 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 relative density (G) for connection design.

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:
   Fire-rated assemblies for Pacific Woodtech LVL shall be constructed in accordance with the recommendations provided by the manufacturer and approved by the authority having jurisdiction (AHJ).

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, as defined in CSA O86, at which the average equilibrium moisture content of solid-sawn lumber over a year is 15 percent or less and does not exceed 19 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 or PR-L233C, and a means of identifying the date of manufacture.

Table 1. LSD Specified Strengths and MOE for Pacific Woodtech LVL[a]

True E		Apparent E		Beam[b]			Plank[c]			Axial	
Grade	E_{true}, MPa (10^6 psi)[d][f]	Grade	$E_{apparent}$, MPa (10^6 psi)[e][f]	F_b, MPa (psi)[g][i]	F_v, MPa (psi)	$F_{c\perp}$, MPa (psi)	F_b, MPa (psi)[h][i]	F_v, MPa (psi)	$F_{c\perp}$, MPa (psi)[j]	F_t, MPa (psi)[k]	F_c, MPa (psi)[l]
1.6E	11,030 (1.6)	1.5E	10,340 (1.5)	28.7 (4,158)	2.95 (0,427)	9.41 (1,365)	28.7 (4,158)	1.76 (255)	8.11 (1,177)	16.3 (2,360)	21.5 (3,112)
1.9E	13,100 (1.9)	1.8E	12,410 (1.8)	35.0 (5,082)	3.65 (0,530)	10.7 (1,547)	35.0 (5,082)	1.76 (255)	8.11 (1,177)	20.1 (2,911)	27.0 (3,910)
2.1E	14,480 (2.1)	2.0E	13,790 (2.0)	37.0 (5,359)	3.65 (0,530)	10.7 (1,547)	37.0 (5,359)	1.76 (255)	8.11 (1,177)	22.8 (3,304)	30.3 (4,389)
2.1E	14,480 (2.1)	2.0E	13,790 (2.0)	39.5 (5,729)	3.65 (0,530)	10.7 (1,547)	39.5 (5,729)	1.76 (255)	8.11 (1,177)	22.8 (3,304)	30.3 (4,389)
2.3E	15,860 (2.3)	2.2E	15,170 (2.2)	39.5 (5,729)	3.65 (0,530)	10.7 (1,547)	39.5 (5,729)	1.76 (255)	8.11 (1,177)	25.5 (3,697)	33.6 (4,868)

[a] The tabulated values apply to protected, dry service conditions, as defined in CSA O86, for the standard-term load duration. All values, except for E and ($F_{c\perp}$), are permitted to be adjusted for other load durations as permitted by 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 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:

In SI Units: $$\delta = \frac{156.3wL^4}{Ebd^3} \times 10^6 + \frac{2400wL^2}{Ebd}$$

Where: δ = estimated deflection, mm; w = uniform load, N/m; L = span, m; E = modulus of elasticity, MPa; b = beam width, mm; d = beam depth, mm

or

In imperial Units: $$\delta = \frac{270wL^4}{Ebd^3} + \frac{28.8wL^2}{Ebd}$$

Where: δ = estimated deflection, inches; w = uniform load, plf; L = span, feet; E = tabulated modulus of elasticity, psi; b = beam width, inches, and; d = beam depth, inches

[e] 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:

In SI Units: $$\delta = \frac{156.3wL^4}{Ebd^3} \times 10^6$$

Where: δ = estimated deflection, mm; w = uniform load, N/m; L = span, m; E = modulus of elasticity, MPa; b = beam width, mm; d = beam depth, mm

or

In Imperial Units: $\delta = \frac{270wL^4}{Ebd^3}$

Where: δ = estimated deflection, inches, w = uniform load, plf
L = span, feet, E = tabulated modulus of elasticity, psi
b = beam width, inches, and d = 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 305 mm (12 inches). For other depths, multiply by a size factor of $(305/d)^{1/5}$, where *d* is the depth in mm. For depths less than 44 mm (1-3/4 in.), multiply by 1.47.

(h) Flexural stress, F_b, for the plank orientation is based on a reference depth of 44 mm (1-3/4 in.). For other depths, multiply by a size factor of $(44/d)^{1/3}$, where *d* is the depth in mm. For depths less than 44 mm (1-3/4 in.), 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 ($F_{c\perp}$) value is based on the average stress at the proportional limit or 1 mm (0.04-in.) deformation, whichever is less.

(k) Tension parallel to grain, F_t, is based on a reference gage length of 6.1 m (20 feet). For longer lengths, multiply by a length factor of $(6.1/L)^{1/10}$, where L is the length in meters.

(l) Compression parallel to grain, F_c.

Table 2. LSD **Factored** Resistances for 32, 38, and 44 mm (1-1/4, 1-1/2, and 1-3/4 in.) Rim Board[a][b][c][d]

True E Grade	Apparent E Grade	Minimum Thickness, mm (in.)	Depth mm (in.)	Vertical Load Capacity		Lateral Load Capacity[f], kN/m (plf)	Deck Ledger Connection[g][h] (1/2" dia. lag screw) kN (lbf)	Deck Ledger Connection[g][h] (1/2" dia. bolt) kN (lbf)	Deck Ledger Connection[g][h][i] (1/2" dia. bolt w/ air gap) kN (lbf)
				Uniform Load[e], kN/m (plf)	Concentrated Load kN (lbf)				
1.6E	1.5E	32 (1-1/4)	302 (11-7/8)	89.9 (6,163)	24.3 (5,452)	3.55 (243)	4.08 (917)	4.08 (917)	2.60 (584)
			356 (14)	75.1 (5,148)	22.9 (5,148)				
			406 (16)	61.4 (4,205)	18.7 (4,205)				
		38 (1-1/2)	302 (11-7/8)	137 (9,396)	29.0 (6,525)	4.44 (304)	4.08 (917)	4.56 (1,026)	4.56 (1,026)
			356 (14)	119 (8,120)	29.0 (6,525)				
			406 (16)	102 (6,960)	29.0 (6,525)				
			457 (18)	82.5 (5,655)	17.4 (3,915)				
			508 (20)	67.7 (4,640)	17.4 (3,915)				
			610 (24)	47.6 (3,263)	14.5 (3,263)				
		44 (1-3/4)	302 (11-7/8)	160 (10,962)	33.5 (7,540)	4.44 (304)	5.01 (1,126)	5.38 (1,209)	4.56 (1,026)
			356 (14)	146 (10,005)	33.5 (7,540)				
			406 (16)	131 (8,990)	33.5 (7,540)				
			457 (18)	116 (7,975)	27.1 (6,090)				
			508 (20)	102 (6,960)	27.1 (6,090)				
			610 (24)	74.1 (5,075)	22.6 (5,075)				

[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 service conditions, as defined in CSA O86, at which the average equilibrium moisture content of solid-sawn lumber over a year is 15 percent or less and does not exceed 19 percent. Applications where the EMC is higher these conditions are outside the scope of this report.
[c] All design values are applicable to the standard-term load duration and shall be adjusted for other load durations in accordance with the applicable code except that the uniform vertical load is not permitted to be increased for any load durations shorter than the standard-term load duration.
[d] Other design values are as provided for 1.6E grade Pacific Woodtech LVL in Table 1.
[e] The factored uniform vertical load is based on the strength of the rim board and may need to be reduced based on the bearing capacity of the supporting wall plate.
[f] The nailing schedule for sheathing to rim and rim board to sill plate (toe-nailed) is based on 2.87 mm x 64 mm (8d box, 0.113 inch x 2-1/2 inches) nails at 150 mm (6 inches) on center. Framing connectors may be used to achieve lateral load capacities exceeding the values shown in this table using the equivalent relative density values listed in Table 4.
[g] Edge distances from the center of the lag screw or bolt to the edge of the rim board and deck ledger must be 51 mm (2 inches) or greater. End distances must be 102 mm (4 inches) or greater.
[h] Deck ledger connections shall be installed following the manufacturer's recommendations.
[i] Air gap is defined as up to 13-mm (½-inch) shimmed air space between Rim Board and deck ledger.

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

Nominal LVL Thickness	Orientation	Nail Size[b]	Nail Diameter, mm (in.)	Nail Length, mm (in.)	Minimum End Distance. mm (in.)	Minimum Nail Spacing[b], mm (in.)		Maximum Nail Penetration[c], mm (in.)
						Single Row	Double Row	
Less than 38 mm (1-1/2 in.)	Edge	8d & smaller	3.32 (0.131)	63.5 (2.5)	63.5 (2-1/2)	76.2 (3)	NA	57.2 (2.25)
		10d & 12d	3.76 (0.148)	82.6 (3.25)	63.5 (2-1/2)	102 (4)		63.5 (2.5)
		16d	4.11 (0.162)	88.9 (3.5)	88.9 (3-1/2)	127 (5)		50.8 (2)
	Face[d]	12d & smaller	3.76 (0.148)	82.6 (3.25)	38.1 (1-1/2)	76.2 (3)	76.2 (3)	
		16d	3.76 (0.148)	88.9 (3.5)	38.1 (1-1/2)	127 (5)	127 (5)	
38 mm (1-1/2 in.) and thicker	Edge	8d & smaller	3.32 (0.131)	63.5 (2.5)	63.5 (2-1/2)	76.2 (3)	102 (4)	57.2 (2.25)
		10d & 12d	3.76 (0.148)	82.6 (3.25)	88.9[e] (3-1/2)	102 (4)	127 (5)	63.5 (2.5)
		16d	3.76 (0.148)	88.9 (3.5)	88.9 (3-1/2)	127 (5)	152[f] (6)	50.8 (2)
	Face[d]	12d & smaller	3.76 (0.148)	82.6 (3.25)	38.1 (1-1/2)	76.2 (3)	76.2 (3)	
		16d	3.76 (0.148)	88.9 (3.5)	38.1 (1-1/2)	127 (5)	127 (5)	

(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 63.5 mm (2-1/2 in.) for single row nailing.
(f) Minimum nail spacing may be reduced to 127 mm (5 in.) when LVL is 44.5 mm (1-3/4 in.) or thicker.

Table 4 Equivalent Relative Density for Connection Design[a]

Connection Type	Face[b]	Edge[c]
Nails or Wood Screws – Withdrawal	0.50	0.47
Nails or Wood Screws – Lateral	0.50	0.50
Bolts or Lag Screws – Lateral	0.50	N. A.

[a] Similar to those values provided in the applicable code for solid sawn lumber having a minimum relative density shown.
[b] Installed perpendicular to the wide face of the LVL.
[c] Installed parallel to the wide face of the LVL.

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