PWT™ Laminated Veneer Lumber and Rim Board PR-L233(C)
PWT Revised August 31, 2024

Products: PWT™ Laminated Veneer Lumber and Rim Board
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1. Basis of the product report:
   - 2020 National Building Code of Canada (NBC): Clause 1.2.1.1 of Division A and Clauses 4.1, 4.3.1.1, and 9.23 of Division B
   - CSA O86-19 Engineering Design in Wood recognized in the 2020 NBC
   - ASTM D5456-18 recognized in CSA O86-19
   - ASTM D7672-19 Standard Specification for Evaluating Structural Capacities of Rim Board Products and Assemblies
   - PFS Corporation Test Reports: Gang-Lam LVL
   - APA Reports T99P-18, T99P-19, T99P-20, T99P-21, T2001P-52, T2001P-76, T2004P-15, T2004P-72, T2005P-37, T2005P-47, T2005P-49, T2005P-72A, T2005P-76A, T2006P-06, T2006P-10, T2006P-21, T2006P-88, T2008P-47, T2009P-45, T2010P-14, T2010P-18, T2011P-24, T2011P-30, T2011P-48, T2011P-68, T2011P-69, T2012P-08, T2012P-20, T2012P-32, T2013P-15, T2014P-16, T2014P-27A, T2014P-28, T2015P-23, T2017P-09, T2017P-20, T2017P-23, T2018P-04, T2018P-06, T2018P-07, T2018P-09, T2019P-52, T2020P-04, T2023P-33, and T2023P-34, and other qualification data

2. Product description:
   PWT LVL is made with wood veneers laminated with grain parallel to the length of the member in accordance with the in-plant manufacturing standard approved by APA. PWT LVL is available with thicknesses up to 89 mm (3-1/2 inches), and a range of widths and lengths. Products up to 178 mm (7 inches) in thickness are fabricated by means of a secondary face-bonding process. PWT X-ply LVL is PWT LVL with two or more veneers oriented 90 degrees (cross-ply) to the length. PWT X-ply LVL is available with a minimum thickness of 29 mm (1-1/8 inches). PWT LVL having a grade of 1.5E or greater can also be used as Part 9 wall studs in accordance with Clause 9.23.10 of the 2020 NBC and in Part 4 engineered wall systems subjected to limitations specified in this report. The minimum thickness of the PWT LVL for wall framing is 38 mm (1-1/2 inches). Refer to the manufacturer's technical guide (www.pwtewp.com) and a local PWT distributor for product availability.

3. Design properties:
   The structural design provisions for wood construction provided in the building code are applicable to PWT LVL unless noted otherwise in this report. Table 1 lists Limit States Design (LSD) properties. Table 2 lists the factored resistances for PWT LVL used as rim board. Minimum spacings for fasteners installed on the edge and face of a member are provided in Table 3. Table 4 lists the equivalent relative density (G) for connection design.

3.1 Beams, headers, joists, rafters, and columns:
   The allowable loads for PWT LVL beams, headers, and columns shall be in accordance with the recommendations provided by the manufacturer (see link above).

3.2 Wall framing:
   PWT LVL having a grade of 1.5E or greater shall be permitted for use as wall studs in accordance with the prescriptive requirements of Part 9 of the 2020 NBC. The specified

shear strength for nailed structural panel shear walls utilizing PWT LVL having a grade of 1.5E or greater shall be determined in accordance with Clause 11.3 of CSA O86 utilizing the equivalent relative density (G) specified in Table 4.

3.2.1 Part 9 Stud Wall Applications: PWT LVL having a grade of 1.5E or greater used as studs are permitted in accordance with Clause 9.23.10 of the 2020 NBC, the conditions specified in Section 4.3 of this report, and the following requirements:

a. Braced wall panels utilizing PWT LVL studs are subject to the limitations in Clause 9.23.1.1 of the 2020 NBC, as applicable,
b. Fasteners for sheathing shall conform to Tables 9.23.3.5.-A and 9.23.3.5.-B of the 2020 NBC,
c. PWT LVL stud size and spacing shall conform to Table 9.23.10.1 of the 2020 NBC, and
d. PWT LVL stud-braced walls shall be detailed in accordance with Clause 9.23.13 of the 2020 NBC and Section 4.3 of this report.

3.2.2 Part 4 Stud Wall Applications: PWT LVL having a grade of 1.5E or greater shall be permitted when designed in accordance with Clause 4.3.1 of the 2020 NBC, the recommendations provided by the manufacturer (see link above), the conditions specified in Section 4.3 of this report, and the following requirements:

a. Blocked shear walls with PWT LVL studs can be used as lateral load resisting systems in wood construction in Canada with no height limitation. Unblocked shear walls are limited to a height of 4.88 m (16 feet) in accordance with Clause 11.5.4 of CSA O86-19.
b. Blocked shear walls shall be used in high seismic zones (i.e., SC3 and SC4 in Part 4 and Sa(0.2) ≥ 0.7 in Part 9 of the 2020 NBC).
c. For double-sided walls:
    1) PWT LVL studs shall be a minimum nominal 2x6 for connections with 8d nails and a minimum nominal 2x8 for connections with 10d nails at any nail spacing of 76 mm (3 inches).
    2) Stud size and sheathing attachment shall be in accordance with Clause 11.3.2 of CSA O86-19.
d. The nail diameter for sheathing-to-framing connections in any wall shall not exceed 3.7 mm (0.148 inch).
e. The nail spacing in any case shall be equal to or greater than 76 mm (3 inches).
f. The size of the nail heads shall meet the requirement specified in CSA B111 or ASTM F1667.
g. Maximum sheathing thickness shall not exceed 15.8 mm (5/8 inch).
h. The stud spacing shall not exceed 610 mm (24 inches) on center.
i. The 64-mm (2.5-inch) stud or double 38-mm (1.5 inches) stud requirements outlined in Clause 11.3.2 of CSA O86-19 shall be applied. The double wall studs shall be constructed by joining single studs by a sufficient number of either nails or screws. The connection between plies shall be designed with mechanical fasteners to resist the shear force at the stud interface and prevent separation of the studs.

4. Product installation:

4.1 Beams, headers, joists, and rafters:
PWT LVL shall be installed in accordance with the recommendations provided by the manufacturer (see link above). Permissible details and allowable hole sizes shall be in accordance with the recommendations provided by the manufacturer.

4.2 Columns:

4.2.1 PWT LVL used as free-standing columns shall not be drilled or notched without the approval of a professional engineer or the manufacturer. Bolts, lag screws, and self-

tapping screws shall only be inserted through the face of the column, perpendicular to the face of the veneers in PWT LVL.

4.2.2 Built-up columns: When used for built-up columns, PWT LVL shall be constructed using connections specified by the manufacturer (see link above).

4.3 Wall framing:

4.3.1 Part 9 Stud Wall Applications: Cutting, notching, and boring of PWT LVL used as studs are permitted in accordance with Clause 9.23.5.3 of the 2020 NBC with the exception that the notch shall not exceed 25% of the stud depth. Stud wall nailing restrictions and requirements are presented in Section 4.3.3 of this report.

4.3.2 Part 4 Engineered Stud Wall Applications: Design for cutting, notching, and boring of PWT LVL shall be based on the recommendations provided by the manufacturer (see link above), a net section analysis in accordance with the provisions of CSA O86, and the following:

a. The factored resistance for bending, axial compression, and axial tension shall be reduced by the Strength Reduction Factors, as specified in Table 5 of this report, to account for stress concentrations.
b. Hole size shall not exceed 40% of the stud depth.
c. The edge distance for holes shall have a minimum clear distance of 16 mm (5/8 inch) for stud depth of 140 mm (5-1/2 inches) and less. For larger studs, the minimum edge distance shall be 12% of the stud depth.
d. Notch depth shall not exceed 25% of the stud depth. The notch length shall not exceed 203 mm (8 inches).
e. Holes or notches shall not be placed with 152 mm (6 inches) of either end of the stud.
f. Holes and notches shall not be placed in the same cross-section. A clear vertical separation of at least twice the length of the notch or twice the diameter of the hole shall be maintained, whichever is greater.
g. Stud wall nailing restrictions and requirements are prescribed in Section 4.3.3 of this report.

4.3.3 Stud wall nailing restrictions and requirements

a. PWT LVL Studs
   - For sheathing attached with 3.3 mm x 64 mm nails (8d common: 0.131 inch x 2-1/2 inches) or smaller with a spacing no closer than 152 mm (6 inches) on center, a single PWT LVL stud shall be permitted for framing at adjoining panel edges. Nails shall be installed a minimum 10 mm (3/8 inch) from all panel edges. 3.8 mm x 76 mm nails (10d common: 0.148 inch x 3 inches) are not allowed where a single PWT LVL stud is used at adjoining panel edges.
   - For sheathing attached with 3.8 mm x 76 mm nails (10d common: 0.148 inch x 3 inches) spaced no closer than 102 mm (4 inches) on center or 3.3 mm x 64 mm nails (8d common: 0.131 inch x 2-1/2 inches) spaced no closer than 76 mm (3 inches) on center a double, stitch-nailed, PWT LVL stud or single 64 mm (2-1/2 inch) thick PWT LVL stud is required at adjoining panel edges. Nails shall be installed a minimum 12.7 mm (1/2 inch) from all panel edges and shall be staggered a minimum of 6 mm (1/4 inch) for each row of nails.

b. For Part 9 Stud Wall Applications: Double PWT LVL studs shall be stitch-nailed together with 2 staggered rows of nails [minimum 3.8 mm x 76 mm nails (10d common: 0.148 inch x 3 inches)] spaced 203 mm (8 inches) in each row.
c. For Part 4 Engineered Stud Wall Applications: The stitch nailing of double PWT LVL studs shall be designed to transfer the required lateral shear using an equivalent relative density of 0.50.
d. Nails into the edge of PWT LVL studs shall not be spaced closer than 76 mm (3 inches) on center.

e. Maximum nail size is 3.8 mm x 76 mm nails (10d common: 0.148 inch x 3 inches).

4.4 Rim board:
PWT LVL used as rim board shall be installed in accordance with the recommendations provided by the manufacturer (see link above) and the code.

5. Fire-rated assemblies:
Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer and approved by the authority having jurisdiction (AHJ), and the following requirements:
   a. The applied factored compressive stress parallel to grain shall not exceed 5.5 MPa (800 psi) for PWT LVL.
   b. When the slenderness ratio, C_C, exceeds 33, the factored resistance, ϕf_c, determined in accordance with Clause 15.3.3.5 of CSA O86-19, shall be multiplied by 0.63 for PWT LVL.

6. Limitations:
   a. PWT LVL shall be designed in accordance with the code using the design properties specified in this report.
   b. PWT 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% or less and does not exceed 19%.
   c. PWT LVL is produced at the PWT manufacturing facilities in Burlington, Washington, USA; Wilmington, North Carolina, USA; and Golden, British Columbia, Canada under a quality assurance program audited by APA. A list of the PWT LVL grades manufactured at different PWT facilities is maintained by APA for independent auditing purposes.
   d. This report is subject to re-examination in one year.

7. Identification:
PWT LVL is sold under the PWT and various private-label brands. Regardless of the brand applied, all products are identified by a label bearing the manufacturer's name (PWT) and/or trademark, the APA assigned plant number (1047 for the Burlington plant, 1066 for the Golden plant, and 1071 for the Wilmington plant), the LVL grade, the APA logo, this report number (PR-L233), and a means of identifying the date of manufacture.

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

Grade	Beam[b]				Plank[c]				Axial	
	E, MPa (10^6 psi)[d][e]	f_b, MPa (psi)	f_v, MPa (psi)	$f_{c\perp}$, MPa (psi)	E, MPa (10^6 psi)[d][e]	f_b, MPa (psi)	f_v, MPa (psi)	$f_{c\perp}$, MPa (psi)[f][g]	f_t, MPa (psi)	$f_{c\parallel}$, MPa (psi)
1.3E X-ply	8,960 (1.3)	19.8[h] (2,865)	3.20 (465)	8.54 (1,240)	7,580 (1.1)	19.8 (2,865)	1.79 (260)	6.87 (1,000)	12.4[i] (1,800)	18.7 (2,715)
1.5E	10,340 (1.5)	28.7[j] (4,160)	3.65 (530)	9.42 (1,365)	10,340 (1.5)	28.7[k] (4,160)	1.92 (280)	8.11 (1,180)	15.5[i] (2,245)	25.9 (3,750)
1.55E	10,690 (1.55)	28.7[l] (4,160)	3.27 (475)	9.42 (1,365)	10,690 (1.55)	28.7[m] (4,160)	1.92 (280)	8.11 (1,180)	15.5[i] (2,245)	25.9 (3,750)
1.6E	11,030 (1.6)	28.7[n] (4,160)	3.27 (475)	9.42 (1,365)	11,030 (1.6)	28.7[m] (4,160)	1.92 (280)	8.11 (1,180)	16.3[o] (2,360)	25.9 (3,751)
2.0E	13,790 (2.0)	37.0[l] (5,360)	3.65 (530)	9.42 (1,365)	13,790 (2.0)	37.6[m] (5,450)	1.79 (260)	6.87 (1,000)	18.6[i] (2,695)	35.2 (5,105)
2.1E	14,480 (2.1)	39.5[n] (5,730)	3.65 (530)	10.67 (1,545)	14,480 (2.1)	39.5[m] (5,730)	1.92 (280)	8.11 (1,180)	22.8[o] (3,300)	35.2 (5,105)
2.2E	15,170 (2.2)	39.5[j] (5,730)	3.72 (540)	9.42 (1,365)	15,170 (2.2)	37.6[k] (5,450)	1.79 (260)	6.87 (1,000)	18.6[i] (2,695)	35.2 (5,105)
2.3E	15,860 (2.3)	39.5[n] (5,730)	3.65 (530)	10.67 (1,545)	15,860 (2.3)	39.5[m] (5,730)	1.92 (280)	8.11 (1,180)	25.5[o] (3,690)	35.2 (5,105)

[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] Coefficient of variation of modulus of elasticity, $COV_E = 0.10$.

[f] The size factor for bearing, KZ_{cp}, shall be equal to 1.0.

[g] 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.

(h) The tabulated value for PWT LVL Rim Board (with cross plies) is based on a reference depth of 305 mm (12 inches). For other depths, when loaded edgewise, the specified bending strength (f_b) shall be modified as follows, based on thickness:
- For thickness of 25 mm (1 inch) and 28 mm (1-1/8 inch), multiply F_b by $(305/d)^{0.323}$, where d = depth in mm.
- For thickness of 32 mm (1-1/4 inch) and greater, multiply F_b by $(305/d)^{0.261}$, where d = depth in mm.

(i) 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 $(6.1/L)^{0.092}$, where L is the length in meters.

(j) The tabulated values for PWT LVL are based on a reference depth of 305 mm (12 inches). For depths greater than 305 mm (12 inches), multiply f_b by $(305/d)^{0.143}$, where d = depth in mm. For depths less than 305 mm (12 inches), multiply f_b by $(305/d)^{0.111}$, where d = depth in mm. For depths less than 89 mm (3-1/2 inches), the factor for the 89-mm (3-1/2-inch) depth shall be used.

(k) For PWT LVL "Billet Beams" up to 178 mm (7 inches) in thickness (see Section 2.2), the specified bending strength (f_b) in plank orientation shall be modified by $(44.5/d)^{0.250} \leq 1.0$, where d = depth in mm.

(l) Flexural stress, f_b, for the beam orientation is based on a reference depth of 305 mm (12 inches). For depths greater than 305 mm (12 inches), multiply f_b by (305/d)0.200. For depths less than 305 mm (12 inches), multiply f_b by $(305/d)^{0.111}$.

(m) 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 f_b by a size factor of $(44/d)^{0.333}$, where d is the depth in mm. For depths less than 44 mm (1-3/4 in.), multiply by 1.00.

(n) Flexural stress, f_b, for the beam orientation is based on a reference depth of 305 mm (12 inches). For other depths, multiply f_b by a size factor of $(305/d)^{0.200}$, where d is the depth in mm. For depths less than 44 mm (1-3/4 in.), multiply by 1.47.

(o) Tension parallel to grain, f_t,is based on a reference gage length of 6.1 m (20 feet). For longer lengths, multiply f_t by a length factor of $(6.1/L)^{0.100}$, where L is the length in meters.

Table 2. Factored Resistances for PWT LVL used as Rim Board[a,b,c,d]

Grade	Thickness, mm (in.)	Depth mm (in.)	Lateral Load Capacity[f], kN/m (plf)	Vertical Load Capacity		Deck Ledger Connection[g][h] 12.7-mm (1/2") dia. Lag Screw kN (lbf)	Deck Ledger Connection[g][h] 12.7-mm (1/2") dia. Bolt kN (lbf)	Deck Ledger Connection[g][h][i] 12.7-mm (1/2") dia. Bolt w/ Air Gap) kN (lbf)
				Uniform Load[e], kN/m (plf)	Concentrated Load kN (lbf)			
1.3E 1550 Fb X-ply	t ≥ 32 (1-1/4)	d ≤ 406 (16)	4.44 (304)	198 (13,558)	27.2(6,105)	3.34 (751)	n/a	n/a
		406 (16) < d ≤ 610 (24)		107 (7,352)				
1.6E 2250Fb 2.1E 3100Fb	t = 32 (1-1/4)	d = 302 (11-7/8)	3.55 (243)	89.9 (6,163)	24.3 (5,452)	4.08 (917)	4.08 (917)	2.60 (584)
		d = 356 (14)		75.1 (5,148)	22.9 (5,148)			
		d = 406 (16)		61.4 (4,205)	18.7 (4,205)			
	t = 38 (1-1/2)	d = 302 (11-7/8)	4.44 (304)	137 (9,396)	29.0 (6,525)	4.08 (917)	4.56 (1,026)	4.56 (1,026)
		d = 356 (14)		119 (8,120)	29.0 (6,525)			
		d = 406 (16)		102 (6,960)	29.0 (6,525)			
		d = 457 (18)		82.5 (5,655)	17.4 (3,915)			
		d = 508 (20)		67.7 (4,640)	17.4 (3,915)			
		d = 61 (24)		47.6 (3,263)	14.5 (3,263)			
	t = 44 (1-3/4)	d = 302 (11-7/8)	4.44 (304)	160 (10,962)	33.5 (7,540)	5.01 (1,126)	5.38 (1,209)	4.56 (1,026)
		d = 356 (14)		146 (10,005)	33.5 (7,540)			
		d = 406 (16)		131 (8,990)	33.5 (7,540)			
		d = 457 (18)		116 (7,975)	27.1 (6,090)			
		d = 508 (20)		102 (6,960)	27.1 (6,090)			
		d = 610 (24)		74.1 (5,075)	22.6 (5,075)			
1.5E 2250Fb 1.55E 2250Fb[j]	38 (1-1/2) ≤ t < 44 (1-3/4)	d ≤ 406 (16)	4.44 (304)	84.6 (5,800)	17.4 (3,915)	3.34 (751)	n/a	n/a
		406 (16) < d ≤ 610 (24)		48.7[k] (3,335)				
2.0E 2900Fb 2.2E 3100Fb	t ≥ 44 (1-3/4)	d ≤ 406 (16)		95.2 (6,525)	20.6 (4,640)	3.34 (751)	n/a	n/a
		406 (16) < d ≤ 610 (24)		73.0 (5,003)				

[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% or less and does not exceed 19%. Applications where the EMC is higher than 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 PWT 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 board 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 12.7-mm (½-inch) shimmed air space between rim board and deck ledger.
[j] Product trademarked with mill number 1047 (Burlington, WA) may use the values for 1.6E.
[k] Product trademarked with mill numbers 1066 (Golden, BC) or 1071 (Wilmington, NC) may use 52.9 (3,625) kN/m (plf).

Table 3. Minimum Spacing and Distance for Fasteners Installed into PWT LVL [a,b,c]

Nominal LVL Thickness	Orientation[d]	Nail Size[e,f]	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	Multiple Rows[g,h]	
Less than 38 mm (1-1/2 in.)	Edge[i]	8d & smaller	3.32 (0.131)	63.5 (2.5)	63.5 (2-1/2)	102 (4)	n/a	57.2 (2.25)
		10d & 12d	3.76 (0.148)	82.5 (3.25)	63.5 (2-1/2)	102 (4)		63.5 (2.5)
		16d	4.11 (0.162)	89.0 (3.5)	88.9 (3-1/2)	127 (5)		50.8 (2)
	Face[j]	8d & smaller	3.32 (0.131)	63.5 (2.5)	38.1 (1-1/2)	76.2 (3)	76.2 (3)	n/a
		12d & smaller	3.76 (0.148)	82.5 (3.25)	38.1 (1-1/2)	76.2 (3)	76.2 (3)	
		16d	3.76 (0.148)	89.0 (3.5)	38.1 (1-1/2)	127 (5)	127 (5)	
38 mm (1-1/2 in.) and thicker	Edge[i]	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)	82.5 (3.25)	88.9 (3-1/2)[k]	102 (4)	127 (5)	63.5 (2.5)
		16d	3.76 (0.148)	89.0 (3.5)	88.9 (3-1/2)	127 (5)	152 (6)[l]	50.8 (2)
	Face[j]	8d & smaller	3.32 (0.131)	63.5 (2.5)	38.1 (1-1/2)	76.2 (3)	76.2 (3)	n/a
		12d & smaller	3.76 (0.148)	82.5 (3.25)	38.1 (1-1/2)	76.2 (3)	76.2 (3)	
		16d	3.76 (0.148)	89.0 (3.5)	38.1 (1-1/2)	127 (5)	127 (5)	

[a] Spacing requirements and maximum nail size for panel edge nailing of wall sheathing at adjoining panels must be in accordance with Section 4.3.4.
[b] Edge distance shall be sufficient to prevent splitting, but not less than permitted in CSA O86.
[c] Nail sizes and closest on-center spacing not specifically described in this table are outside the scope of this report.
[d] Face orientation applies to nails driven into the face of the member, such that the long axis of the nail is perpendicular to the wide faces of the veneers. Edge orientation applies to nails driven into the edge of the member.
[e] Nails listed are common wire nails. For box nails, the spacing and end distance requirements of the next shorter common nail may be used: e.g., a 16d box nail may be spaced the same as a 10d and 12d common nail. Larger nail sizes and shank types not specifically described above are beyond the scope of this report.
[f] 16d sinkers: 3.76 mm (0.148 inch) x 82.5 mm (3-1/4 inches) may be spaced the same as a 12d common wire nail: 3.76 mm (0.148 inch) x 82.5 mm (3-1/4 inches).
[g] Multiple rows must be spaced 12.7 mm (½ inch) or more from each other and offset one-half of the tabulated minimum nail spacing, as shown in Figure 1.
[h] Multiple rows must be equally spaced about the centerline of the edge or face (whichever applies).
[i] Nail penetration for edge nailing shall not exceed 51 mm (2 inches) for 89 mm (3-1/2 inches (16d common)) nails and 64 mm (2-1/2 inches) for all nails with a smaller shank diameter.
[j] Tabulated closest on-center spacing for face orientation is applicable to nails that are installed in rows parallel to the grain (length) of the member. For nails installed in rows perpendicular to the direction of grain (width/depth) of the member, the closest on-center spacing for face orientation shall be sufficient to prevent splitting.
[k] Minimum end distance is permitted to be reduced to 63.5 mm (2-1/2 inches) for single row nailing.
[l] Minimum nail spacing may be reduced to 127 mm (5 in.) when LVL is 44.5 mm (1-3/4 in.) or thicker.

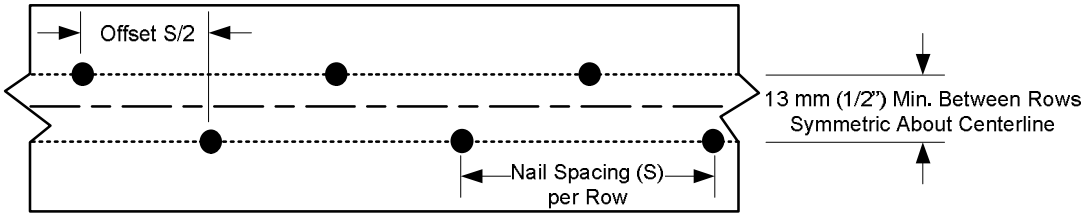

Figure 1. Spacing of multiple rows of nails.

Table 4. Equivalent Relative Density (G) for Connection Design in PWT LVL[a,b,c]

Nails		Nails and Wood Screws		Bolts and Lag Screws[d]	
Withdrawal Load		Lateral Load		Lateral Load	
Installed in Edge[e]	Installed in Face	Installed in Edge	Installed in Face	Installed in Face[f]	
				Parallel to Grain	Perpendicular to Grain
0.46	0.50	0.50	0.50	0.46	0.50

(a) Fastener types and orientation not specifically described in this table are beyond the scope of this report.
(b) Fastener design values calculated using the tabulated equivalent specific gravities given above must be adjusted by the applicable adjustment factors specified in the NDS for connections.
(c) Fastener spacing, and end and edge distances must be as specified in CSA O86, except that nail spacing and end distance must be as specified in Table 3.
(d) The capacities for 12.7-mm (1/2-inch)-diameter lag screws installed into PWT LVL used as rim board for ledger attachment shall be in accordance with Table 2.
(e) Edge orientation applies to member faces showing the narrow edge of all veneers, typically the narrow faces of the member.
(f) Face orientation applies to member faces showing the face of one veneer, typically the wide faces of the member.

Table 5. Strength Reduction Factors for Notches and Holes in PWT LVL used as Studs[a,b,c]

Notches			Holes		
Bending	Compression	Tension	Bending	Compression	Tension
0.80	0.90	0.60	0.95	0.95	0.95

(a) Design of PWT LVL used as studs with notches and holes used in engineered wall framing shall be based on a net-section analysis in accordance with CSA O86. See Section 4.3.2 of this report for limitations on the maximum size and placement of notches and holes.
(b) The factored resistances for bending, compression, and tension shall be multiplied by the strength reduction factors in the above table.
(c) See Section 4.3 for notching and boring of holes in PWT LVL used as studs used in prescriptive wall framing.

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