# Joint Evaluation Report

**ESR-2909**

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*This report also contains:*

**-CBC Supplement**

**-FBC Supplement**

**-LABC Supplement**

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| DIVISION: 06 00 00 - WOOD, PLASTICS, AND COMPOSITES<br><br>Section: 06 17 13—Laminated Veneer Lumber | REPORT HOLDER:<br><br>PACIFIC WOODTECH CORPORATION | EVALUATION SUBJECT:<br><br>PWT™ LAMINATED VENEER LUMBER (LVL), PWT™ TREATED LVL AND PWT™ RIM BOARDS | |
|---|---|---|---|

## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2021, 2018, 2015 and 2012 *International Building Code®* (IBC)
- 2021, 2018, 2015 and 2012 *International Residential Code®* (IRC)

For evaluation for compliance with codes adopted by the *Los Angeles Department of Building and Safety* (LADBS), see ESR-2909 LABC and LARC Supplement.

**Properties evaluated:**

- Structural
- Fire resistance and blocking

## 2.0 USES

PWT™ Laminated Veneer Lumber (LVL) is used in structural applications such as beams, headers, joists, rafters, columns, wall studs, and wall plates.

PWT™ Treated LVL is used in above ground structural applications such as structural components which are difficult to maintain repair or replace and are critical to the performance and safety of the entire system/construction.

PWT™ Rim Boards are used in rim board applications as described in this report.

## 3.0 DESCRIPTION

**3.1 General:** PWT™ LVL described in this report complies with ASTM D5456 and additional performance requirements specified in the ICC-ES Acceptance Criteria (AC47, AC124 and AC202) as required.

**3.2 PWT™ LVL:** PWT™ LVL consists of layers of wood veneers laminated together using an exterior-type structural adhesive. The wood veneer properties and species, adhesive, manufacturing parameters, and finished product dimensions and tolerances are as specified in the approved quality documentation and manufacturing standard. The veneers are laminated with the grain parallel to the length of the member.

**3.3 PWT™ Treated LVL:** PWT™ Treated LVL is fabricated with adhesive incorporated with Propiconazole Tebuconazole Imidacloprid (PTI) as part of the wood glue-line preservative system during the LVL manufacturing process for fungal and decay resistance to wood destroying insects, including Formosan termites, to a retention level equivalent to that specified in ICC-ES Evaluation Report ESR-3834 for the Use Categories UC1 through UC4A. PWT™ Treated LVL shall be limited to the above ground applications including, but not limited to, structural members that are hard to maintain, repair or replace and are critical to the performance and safety of the structure system. The wood veneer properties and species, PTI treated adhesive, manufacturing parameters, and finished product dimensions and tolerances are as specified in the approved quality documentation and manufacturing standard.

**3.4 PWT™ X-Ply LVL:** PWT™ X-Ply LVL used as rim board is fabricated with two or more veneers oriented 90 degrees (cross-ply) to the length. The wood veneer properties and species, adhesive, manufacturing parameters, and finished product dimensions and tolerances are as specified in the approved quality documentation and manufacturing standard.

## 4.0 DESIGN AND INSTALLATION

### 4.1 General:

The design provisions for structural composite lumber in ANSI/AWC *National Design Specification*® (NDS) *for Wood Construction*, as referenced in the applicable code, are applicable to PWT™ LVL, unless otherwise noted in the report. Reference design values for PWT™ LVL and PWT™ Treated LVL are provided in Tables 1A and 1B.

### 4.2 Connections:

The design of mechanical connections in PWT™ LVL must be in accordance with the NDS. Minimum nail spacing and end distance requirements are given in Table 3. Equivalent specific gravities for the design of nail, bolt, and lag screw connections under dry use conditions are given in Table 4. Nailing requirements for the attachment of wall sheathing are given in Section 4.3.3.

**Exception:** Lag screw connections between PWT™ LVL used as rim board and deck ledgers have an allowable lateral load as specified in Table 2 provided all the following conditions are met:

a. Lag screws must have a minimum nominal diameter of $^1/_2$ inch (12.7 mm), and sufficient length so that the full diameter of the lag screw shank penetrates through the rim board (the tapered tip must pass completely through the rim board).

b. Deck ledgers must have a minimum thickness of 1-½ inches (38 mm) and a minimum assigned specific gravity of 0.42.

c. Sheathing between the rim board and the deck ledger must consist of wood structural panels meeting PS-1 or PS-2 and be attached to the rim board in accordance with the applicable code.

d. One flat washer must be used between the deck ledger and the lag screw head.

e. Edge distances from the center of the lag screw to the edges of the rim board and deck ledger must be 2 inches (51 mm) or greater. End distances must be 4 inches (102 mm) or greater.

f. Adjustment factors in accordance with the NDS must be applied as applicable.

g. Rim boards and deck ledgers must be checked for load-carrying capacity at connections in accordance with the NDS.

### 4.3 Wall Studs:

**4.3.1 Prescriptive Wall Framing**: PWT™ LVL having a grade of 1.5E or greater, is considered equivalent to sawn lumber studs for prescriptive wall framing applications in accordance with Section 2308.5 of the 2021, 2018 and 2015 IBC (Section 2308.9 of the 2012 IBC) and Section R602 of the IRC, subject to the following conditions:

1. PWT™ LVL used as studs must have a thickness of 1-$^1/_2$ inches (38 mm) or greater.

2. Cutting, notching, and boring of 3-$^1/_2$-inch-deep (89 mm) and 5-$^1/_2$-inch-deep (140 mm) PWT™ LVL used as studs used in prescriptive wall framing is permitted in accordance with Sections 2308.5.9 and 2308.5.10 of the 2021, 2018 and 2015 IBC (Sections 2308.9.10 and 2308.9.11 of the 2012 IBC), and Section R602.6 of the IRC.

3. Connections between wall sheathing and PWT™ LVL framing must meet the requirements of Section 4.3.3.

**4.3.2 Engineered Wall Framing:** PWT™ LVL having a grade of 1.5E or greater, may be used in engineered wall framing applications, subject to the following conditions:

1. PWT™ LVL studs are equivalent to sawn lumber studs with a maximum specific gravity of 0.50.

2. PWT™ LVL studs must have a thickness of 1-$^1/_2$ inches (38 mm) or greater.

3. Notching and boring of PWT™ LVL studs is permitted in engineered wall assemblies. The design must be based on net-section analysis in accordance with the NDS, and is subject to the following additional conditions and allowable stress reductions:

   a. Holes up to 40 percent of the depth of the stud are permitted anywhere along the stud length, except that a hole must not be placed within 6 inches (152 mm) of the end of the stud. A minimum edge distance, measured from the edge of the hole to the edge of the member, must be maintained for all holes as follows (see Figure 2):

   (1) $^5/_8$ inch (16 mm) for studs 5-$^1/_2$ inches deep (140 mm) or less, or

   (2) 12 percent of the stud depth for studs more than 5-$^1/_2$ inches deep (140 mm).

   b. Notches up to 25 percent of the depth of the stud are permitted anywhere along the stud length, except that a notch must not be placed within 6 inches (152 mm) of the end of the stud. The notch length must not exceed 8 inches (203 mm).

   c. Holes and notches must not be cut in the same cross section and must be separated by a clear, vertical distance of two times the larger of the hole diameter or the notch height, whichever is greater.

   d. The reference design stresses for bending, axial compression, and axial tension must be multiplied by a stress reduction factor to account for stress concentrations at notches and holes, as given in Table 5.

4. Connections between wall sheathing and PWT™ LVL framing must meet the requirements of Section 4.3.3.

**4.3.3 Nailing Requirements:** When PWT™ LVL members are used as wall studs, the sheathing-to-stud and stud-to-stud connections must meet the following requirements:

1. A single 1-$^1/_2$-inch-thick (38 mm) stud may be used for framing at adjoining panel edges for wall sheathing attached as follows:

   a. 8d common nails spaced no closer than 6 inches (152 mm) on center and

   b. 10d common nails are not allowed.

   c. See Detail A in Figure 3.

2. A minimum 2-$^1/_2$-inch-thick (64 mm) single stud or a double 1-$^1/_2$-inch (38 mm) or thicker stud is required for framing at adjoining panel edges for wall sheathing attached as follows:

   a. 10d common nails spaced no closer than 4 inches (102 mm) on center,

   b. or 8d common nails spaced no closer than 3 inches (76 mm) on center, staggered a minimum of ¼ inch (6.4 mm) horizontally.

   c. See Detail B in Figure 3.

3. Where double studs are required at adjoining panel edges, they must be connected together as follows:

   a. For stud wall applications in accordance with the IRC and the conventional light-frame provisions of the Section 2308 of the IBC and Table 2304.10.1 of the 2021, 2018 and 2015 IBC (Table 2304.9.1 of the 2012 IBC), double studs must be stitch-nailed together with a minimum of two staggered rows of 10d nails [2-$^7/_8$ inches (73 mm) by 0.120 inch (3.05 mm) in diameter] spaced 8 inches (203 mm) on center in each row.

   b. For engineered stud wall applications, double studs must be stitch-nailed together with a connection designed to transfer the required lateral shear, using an assumed equivalent specific gravity of 0.50. When stitch-nailing two 1-$^3/_4$-inch-thick (44 mm) studs, 3-inch (76 mm) or longer nails are required.

   c. The stitch nails must be driven in two lines spaced approximately 1 inch (25 mm) from each stud edge.

4. Where double studs are required at adjoining panel edges, the panel-edge nails must be installed with a minimum ½-inch (12.7 mm) edge distance from the panel edges, and staggered a minimum of ¼ inch (6.4 mm) horizontally within each line of nails.

5. The maximum allowable nail size for attaching wall sheathing to the edge of a stud is 10d common [3 inches (76 mm) by 0.148 inch (3.76 mm) in diameter].

**4.3.4 Wall Plates:** PWT™ LVL may be used as bottom (sole) plates and top plates, except where preservative-treated wood is required by Section 2304.12 of the 2021, 2018 and 2015 IBC (Section 2304.11 of the 2012 IBC) and Sections R317 and R318 of the 2021, 2018, 2015, and 2012 IRC. PWT™ Treated LVL may be used where preservative-treated wood is required.

**4.4 Rim Boards and Blocking:**

PWT™ LVL used as rim board must be continuously supported across the full width (except as noted in Section 4.4.2), and must be located at the joist elevation either perpendicular to, or parallel to, the joist framing. It must be the full depth of the joist space and be used for any combination of the following:

- To transfer, from above to below, all vertical loads at the rim board location. Allowable vertical loads are given in Table 2.
- To provide diaphragm attachment (sheathing to top edge of rim board).
- To transfer in-plane lateral loads from the diaphragm to the wall plate below. Allowable in-plane lateral loads are given in Table 2.
- To provide lateral support to the joist or rafter (resistance against rotation) through attachment to the joist or rafter.
- To provide closure for ends of joists or rafters.
- To provide an attachment base for siding and/or an exterior deck ledger.

**4.4.1** Rim board must be installed in accordance with the provisions of the applicable code, and design loads must not exceed those given in Table 2.

**4.4.2** Installation of PWT™ LVL used as rim board over wall openings is permitted, provided the rim board is designed for all applicable stresses in accordance with Sections 4.1 and 4.2 adjusted by the applicable adjustment factors. Joints in the rim board are not allowed within 12 inches (305 mm) of the opening.

**4.4.3** PWT™ LVL having minimum thicknesses as given in Table 4 may be used as direct replacements for the nominally 2-inch-thick solid blocking specified in Section 2308.4.2.3 of the 2021, 2018 and 2015 IBC (Section 2308.8.2 of the 2012 IBC) and Section R502.7 of the IRC.

**4.5 Fire Resistance and Fire Blocking:**

**4.5.1 Calculated Fire Resistance:** The fire resistance of exposed PWT™ LVL may be calculated in accordance with the NDS.

**4.5.2 Fire-resistance-rated Floor and Roof Systems:** PWT™ LVL having a grade of 1.5E or greater, may be used as direct replacements for non-fire-retardant-treated sawn lumber, of equivalent size, in the prescriptive fire-resistance-rated floor and roof assemblies listed in Table 721.1(3) of the 2021, 2018, 2015 and 2012 IBC.

**4.5.3 Fire Protection of Floors:** PWT™ LVL having a grade of 1.5E or greater, having a minimum thickness of 1-$^1/_2$ inches (38 mm) and a minimum depth of 9-$^1/_4$ inches (235 mm), is considered equivalent to lumber joists in accordance with Exception 4 to Section R302.13 of the 2021, 2018 and 2015 IRC (Section R501.3 of the 2012 IRC).

**4.5.4 Fire-resistance-rated Wall Construction:** PWT™ LVL wall studs described in Section 4.3 are permitted to be used in fire-resistance-rated wall construction as follows:

1. For conventional light-frame construction, PWT™ LVL may be used as direct replacements for non-fire-retardant-treated sawn lumber studs of equivalent size in the prescriptive fire-resistance-rated wall assemblies listed in Table 721.1(2) of the 2021, 2018, 2015, and 2012 IBC, subject to the following conditions:
   a. The stud must be 1-$^1/_2$ inches (38 mm) by 3-$^1/_2$ inches (89 mm) or greater in size.

   b. Tape and joint compound must be applied to fastener heads and gypsum wallboard joints on exposed surfaces.

2. For engineered, load-bearing wall construction, PWT™ LVL are permitted to be used in 1-hour fire-resistance-rated wall assemblies meeting the following conditions:
   a. The minimum stud size must be 1-$^1/_2$ inches (38 mm) by 3-$^1/_2$ inches (89 mm) or greater.

b. Studs must be spaced no more than 24 inches (610 mm) on center.

c. Minimum 5/8-inch (15.9 mm) Type X gypsum wallboard must be attached with 2-$^1/_4$-inch-long (57 mm) Type S drywall screws spaced 7 inches (178 mm) on center along each stud.

d. Minimum 2.5 pcf (40 kg/m$^3$) mineral wool insulation must be placed in each stud cavity.

e. Tape and joint compound must be applied to fastener heads and gypsum wallboard joints on the exposed surface(s).

f. The design axial compressive stress within the studs must not exceed the least of the following:

i. 550 psi (3790 kPa) for LVL.

ii. 0.63$F_c$' for LVL; where $F_c$' is the compression design value parallel-to-grain, adjusted by all applicable adjustment factors in accordance with the NDS, including the column stability factor, $C_P$.

iii. 0.63$F_c$' for LVL; where $F_c$' is the compression design value parallel-to-grain, adjusted for all applicable adjustment factors in accordance with the NDS, and where $C_P$ is evaluated at a slenderness ratio of 33.

**4.5.5 Fire Blocking:** PWT™ LVL may be used as fire blocking in lieu of the materials listed in Section 718.2.1 of the 2021, 2018, 2015 and 2012 IBC, and Section R302.11.1 of the IRC, as applicable. PWT™ LVL used as fire blocking must have a minimum thickness of 1-$^1/_4$ inches (31.8 mm).

## 5.0 CONDITIONS OF USE

The PWT™ LVL, PWT™ Treated LVL and PWT™ Rim Boards described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

**5.1** Design and installation must comply with this report, the manufacturer's published installation instructions, and the applicable code. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

**5.2** Design calculations and details must be furnished to the code official verifying that the material is used in compliance with this report. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

**5.3** Use of PWT™ LVL must be limited to dry, well-ventilated, protected application in which the in-service average moisture content of lumber is less than 16 percent.

**5.4** PWT™ Treated LVL may be used in exterior construction above ground applications (UC3B), including components that are difficult to maintain, repair, or replace and are critical to the performance and safety of the building structure. PWT™ Treated LVL may be used in interior applications.

**5.5** The use of treatments on the products listed in this report, such as fire retardants, is outside the scope of this report.

**5.6** PWT™ LVL products are produced at the Pacific Woodtech Corporation manufacturing plant located in Burlington, Washington; Golden, British Columbia, Canada; and Wilmington, North Carolina facilities under a quality-control program with inspections by ICC-ES and APA—The Engineered Wood Association (AA-649).

## 6.0 EVIDENCE SUBMITTED

**6.1** Data in accordance with the ICC-ES Acceptance Criteria for Structural Wood-based Products (AC47), dated June 2017 (Editorially revised February 2021).

**6.2** Data in accordance with the ICC-ES Acceptance Criteria for Rim Board Products (AC124), dated June 2019 (Editorially revised February 2021).

**6.3** Data in accordance with the ICC-ES Acceptance Criteria for Wood-based Studs (AC202), dated June 2009 (Editorially revised February 2021).

## 7.0 IDENTIFICATION

**7.1** The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-2909) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

**7.2** PWT™ LVL and PWT™ Rim Board products are identified with a stamp noting the manufacturer's name (Pacific Woodtech), grade, production date, evaluation report number (ESR-2909), qualified inspection agency name or logo (APA), and manufacturer's APA mill number (1047 for Burlington, WA; 1066 for Golden, BC; 1071 for Wilmington, NC).

**7.3** PWT™ Treated LVL products are identified with a stamp noting the manufacturer's name (Pacific Woodtech), product trade name, grade, production date, evaluation report number (ESR-2909), qualified inspection agency name/logo (APA), and manufacturer's APA mill number (1047).

**7.4** The report holder's contact information is the following:

**PACIFIC WOODTECH CORPORATION**
**1850 PARK LANE**
**BURLINGTON, WASHINGTON 98233**
**(888) 707-2285**
**www.pacificwoodtech.com**

**TABLE 1A – PWT™ LVL AND PWT™ TREATED LVL REFERENCE DESIGN VALUES (psi) [1, 2, 3, 4, 5]**

| Grade | Beam | | | | Plank | | | | Axial | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MOE[6, 7] ($10^6$ psi) | $F_b$[8] (psi) | $F_v$ (psi) | $F_{c\perp}$[9] (psi) | MOE[6, 7] ($10^6$ psi) | $F_b$[8] (psi) | $F_v$ (psi) | $F_{c\perp}$[9] (psi) | $F_t$ (psi) | $F_c$ (psi) |
| 1.3E 1550Fb X-ply | 1.3 | 1,550[10] | 250 | 680 | 1.1 | 1,550 | 140 | 550 | 1,200[16] | 1,700 |
| 1.5E 2250Fb | 1.5 | 2,250[11] | 285 | 750 | 1.5 | 2,250[12] | 150 | 650 | 1,500[16] | 2,350 |
| 1.55E 2250Fb | 1.55 | 2,250[13] | 255 | 750 | 1.55 | 2,250[15] | 150 | 650 | 1,500[16] | 2,350 |
| 1.6E 2250Fb | 1.6 | 2,250[14] | 255 | 750 | 1.6 | 2,250[15] | 150 | 650 | 1,500[17] | 2,350 |
| PWT Treated | 2.0 | 2,800[14] | 285 | 850 | 2.0 | 2,800[15] | 150 | 650 | 2,100[17] | 2,500 |
| 2.0E 2900Fb | 2.0 | 2,900[13] | 285 | 750 | 2.0 | 2,950[15] | 140 | 550 | 1,800[16] | 3,200 |
| 2.1E 3100Fb | 2.1 | 3,100[14] | 285 | 850 | 2.1 | 3,100[15] | 150 | 650 | 2,100[17] | 3,200 |
| 2.2E 3100Fb | 2.2 | 3,100[11] | 290 | 750 | 2.2 | 2,950[12] | 140 | 550 | 1,800[16] | 3,200 |
| 2.3E 3100Fb | 2.3 | 3,100[14] | 285 | 850 | 2.3 | 3,100[15] | 150 | 650 | 2,350[17] | 3,200 |

For **SI:** 1 psi = 6.895 kPa, 1 inch = 25.4 mm.

[1]Reference 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 percent. Except for PWT™ Treated LVL, applications where the EMC will equal or exceed 16 percent are outside the scope of this report. Design values for PWT™ Treated LVL when used in EMC of 16% or greater are provided in Table 1B.
[2]Reference design values must be adjusted, as applicable, in accordance with Section 8.3 of the NDS.
[3]Beam values apply to members loaded and supported on faces showing the narrow edge of all veneers, typically the narrow faces of the member (see Figure 1).
[4]Plank values apply to members loaded and supported on faces showing the face of one veneer, typically the wide faces of the member (see Figure 1).
[5]Reference design values for bending, axial compression, and axial tension for studs with notches or holes in engineered wall framing must be multiplied by the strength reduction factors in Table 5.
[6]The tabulated MOE values are the shear-free modulus of elasticity, also known as true E. When calculating deflection, both bending and shear deflections must be included. The deflection equation for a simple-span beam under uniform load is:

$$\Delta = \frac{270wL^4}{Ebd^3} + \frac{28.8wL^2}{Ebd}$$

Where:

$\Delta$ = Deflection i (in).
w = Uniform load (plf).
L = Design span in feet (ft).
b = Beam width (in).
d = Beam depth (in).
E = Shear Free Modulus of Elasticity (MOE) (psi).

[7]Coefficient of variation of modulus of elasticity, $COV_E$ = 0.10.
[8]Flexural stress, $F_b$, may be increased by 4% when the member qualifies as repetitive as defined in the NDS.
[9]Plank compression perpendicular to grain ($F_{c\perp}$) values are allowed to be adjusted by the Bearing Area Factor ($C_b$) stipulated in the NDS.
[10]Flexural stress, $F_b$, for the beam orientation is based on a reference depth of 12 inches. For other depths, modify $F_b$ as follow:

- For thickness of 1-1/8 inches, multiply $F_b$ by $(12/d)^{0.323}$.
- For thickness of 1-¼ inches and greater, multiply $F_b$ by $(12/d)^{0.261}$.

[11]Flexural stress, $F_b$, for the beam orientation is based on a reference depth of 12 inches. For depths greater than 12 inches, multiply Fb by $(12/d)^{0.143}$. For depths less than 12 inches, multiply Fb by $(12/d)^{0.111}$. For depths less than 3-1/2 inches, multiply by 1.147.
[12]Flexural stress, $F_b$, for the plank orientation is based on a reference depth of 1-¾ inches. For other depths, multiply by a size factor of $(1.75/d)^{0.250}$. For depths less than 1-¾ inches, multiply by 1.00.
[13]Flexural stress, $F_b$, for the beam orientation is based on a reference depth of 12 inches. For depths greater than 12 inches, multiply $F_b$ by $(12/d)^{0.200}$. For depths less than 12 inches, multiply $F_b$ by $(12/d)^{0.111}$. For depths less than 3-1/2 inches, multiply by 1.147.
[14]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 $(12/d)^{0.200}$. For depths less than 1-¾ inches, multiply by 1.47.
[15]Flexural stress, $F_b$, for the plank orientation is based on a reference depth of 1-3/4 inches. For depths greater than 1 ¾ inches, multiply $F_b$ by $(1.75/d)^{0.333}$. For depths less than 1-¾ inches, multiply by 1.00.
[16]Tension parallel to grain, $F_t$, is based on a reference length of 3 feet. For other lengths, the allowable tensile stress shall be modified by $(3/L)^{0.111}$, where L = length in feet. For lengths less than 3 feet, use the allowable tension stresses in Table 1.
[17]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 $(4/L)^{0.100}$, where L is the length in feet. For lengths less than 4 feet, use the allowable tension stresses in Table 1.

**TABLE 1B – PWT™ TREATED LVL REFERENCE DESIGN VALUE FOR WET USE[1, 2, 3, 4, 5]**

| Grade | Beam | | | | Plank | | | | Axial | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MOE[6, 7] ($10^6$ psi) | $F_b$[8] (psi) | $F_v$ (psi) | $F_{c\perp}$[9] (psi) | MOE[6, 7] ($10^6$ psi) | $F_b$[8] (psi) | $F_v$ (psi) | $F_{c\perp}$[9] (psi) | $F_t$ (psi) | $F_c$ (psi) |
| PWT Treated | 1.4 | 1,680[14] | 160 | 465[18] | 1.4 | 1,680[15] | 100 | 355[18] | 1,780[17] | 875 |

For **SI:** 1 psi = 6.895 kPa, 1 inch = 25.4 mm.

[1]Reference design values are based on wet 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 16% or greater.
[2]Reference design values must be adjusted, as applicable, in accordance with Section 8.3 of the NDS, except for the wet service factor ($C_M$).
[3-9, 14, 15, 17]See the corresponding Footnotes to Table 1A.
[18]Deformation up to 0.125 inch could occur at the tabulated compressive stress perpendicular to grain in wet-use conditions.

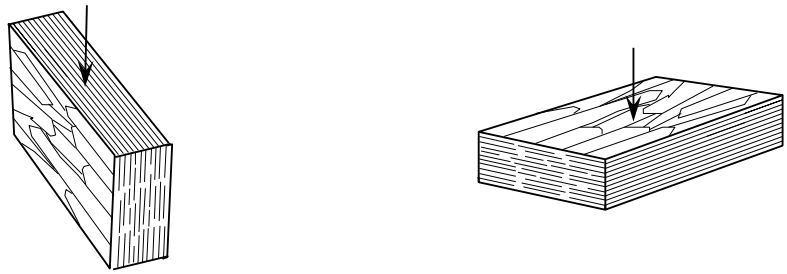

**FIGURE 1 – BEAM AND PLANK ORIENTATION AS NOTED IN TABLE 1**

**TABLE 2 – ALLOWABLE LOADS FOR PWT™ LVL USED AS RIM BOARD[1, 2, 3, 4]**

| Grade | Thickness (in) | Depth (in) | Lateral Load Capacity[5,6] (lbf/ft) | Vertical Uniform Load[7] (lbf/ft) | Vertical Concentrated Load (lbf) | Deck Ledger Connection[8] for ½ inch dia. Lag Screws (lbf) | Deck Ledger Connection for ½ inch dia. Bolt (lbf) | Deck Ledger Connection for ½ inch dia. Bolt w/ air gap[9] (lbf) |
|---|---|---|---|---|---|---|---|---|
| 1.3E 1550Fb X-ply | t ≥ 1-1/4 | d ≤ 16 | 250 | 9,350 | 4,210 | 450 | n/a | n/a |
| | | 16 < d ≤ 24 | | 5,070 | | | | |
| 1.6E 2250Fb 2.1E 3100Fb | t = 1-1/4 | d = 11-7/8 | 200 | 4,250 | 3,760 | 550 | 550 | 350 |
| | | d = 14 | | 3,550 | 3,550 | | | |
| | | d = 16 | | 2,900 | 2,900 | | | |
| | t = 1-1/2 | d = 11-7/8 | 250 | 6,480 | 2,900 | 550 | 615 | 615 |
| | | d = 14 | | 5,600 | 4,500 | | | |
| | | d = 16 | | 4,800 | 4,500 | | | |
| | | d = 18 | | 3,900 | 2,700 | | | |
| | | d = 20 | | 3,200 | 2,700 | | | |
| | | d = 24 | | 2,250 | 2,250 | | | |
| | t = 1-3/4 | d = 11-7/8 | 250 | 7,560 | 5,200 | 675 | 725 | 615 |
| | | d = 14 | | 6,900 | 5,200 | | | |
| | | d = 16 | | 6,200 | 5,200 | | | |
| | | d = 18 | | 5,500 | 4,200 | | | |
| | | d = 20 | | 4,800 | 4,200 | | | |
| | | d = 24 | | 3,500 | 3,500 | | | |
| 1.5E 2250Fb 1.55E 2250Fb[10] 2.0E 2900Fb 2.2E 3100Fb | 1-1/2 ≤ t < 1-3/4 | d ≤ 16 | 250 | 4,000 | 2,700 | 550 | n/a | n/a |
| | | 16 < d ≤ 24 | | 2,300[11] | | | | |
| | t ≥ 1-3/4 | d ≤ 16 | | 4,500 | 3,200 | | | |
| | | 16 < d ≤ 24 | | 3,450 | | | | |

For **SI:** 1 inch = 25.4 mm,1 plf = 14.59 N/m, 1 lb = 4.448 N.

[1]Tabulated design values are based on protected, dry service conditions, 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.

[2]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 with the NDS except the uniform vertical load and concentrated vertical load are not allowed to be increased for any load durations shorter than the normal load duration (10 years).

[3]See Table 3 for minimum nail spacing requirements.

[4]Other design values are as provided for PWT™ LVL in Table 1.

[5]Toe-nailed connections are not limited by the 150 lbf/ft lateral load capacity noted for Seismic Design Categories D, E, and F in the SDPWS.

[6]The nailing schedule for sheathing to rim and rim board to sill plate (toe-nailed) is based on 8d box (0.113-inch x 2-1/2 inches) nails at 6 inches on center. Lateral load capacity is permitted to be increased by a factor of 1.4 when subjected to wind loads. Commercial framing connectors may be used to achieve lateral load capacities exceeding the values in this table. Calculations shall be based on the equivalent specific gravity values listed in Table 4 subjected to the nailing spacing provided in Table 3.

[7]The allowable vertical uniform load capacity 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 or the attached floor sheathing.

[8]Lag screw connections between rim board and deck ledgers have allowable lateral loads as specified in the table above, provided the conditions under the exception to Section 4 are met.

[9]Air gap is defined as up to 0.50-inch shimmed air space between rim board and deck ledger.

[10]Product trademarked with mill number 1047 (Burlington, WA) may use the values for 1.6E 2250Fb.

[11]Product trademarked with mill numbers 1066 (Golden, BC) or 1071 (Wilmington, NC) may use 2,500.

**TABLE 3 – ALLOWABLE NAIL SPACING FOR PWT™ LVL[1, 2, 3]**

| Thickness (in) | Orientation[4] | Common Nail Size[5, 6] | Diameter (in) | Length (in) | Minimum End Distance (in) | Minimum Nail Spacing (in) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Single Row | Multiple Rows[7] |
| < 1-1/2 | Edge[8] | 8d & smaller | 0.131 | 2 ½ | 2 ½ | 4[10] | n/a |
| | | 10d & 12d | 0.148 | 3 ¼ | 2 ½ | 4 | n/a |
| | | 16d | 0.162 | 3 ½ | 3 ½ | 5 | n/a |
| | Face[9] | 8d & smaller | 0.131 | 2 ½ | 1 ½ | 3 | 3 |
| | | 10d & 12d | 0.148 | 3 ¼ | 1 ½ | 3 | 3 |
| | | 16d | 0.162 | 3 ½ | 1 ½ | 5 | 5 |
| ≥ 1-1/2 | Edge[8] | 8d & smaller | 0.131 | 2 ½ | 2 ½ | 3 | 4[11] |
| | | 10d & 12d | 0.148 | 3 ¼ | 3 ½[12] | 4 | 5[13] |
| | | 16d | 0.162 | 3 ½ | 3 ½ | 5 | 6[14] |
| | Face[9] | 8d & smaller | 0.131 | 2 ½ | 1 ½ | 3 | 3 |
| | | 10d & 12d | 0.148 | 3 ¼ | 1 ½ | 3 | 3 |
| | | 16d | 0.162 | 3 ½ | 1 ½ | 5 | 5 |

For **SI:** 1 inch = 25.4 mm.

[1]Spacing requirements and maximum nail size for panel edge nailing of wall sheathing at adjoining panels must be in accordance with Section 4.3.2 and Figure 3.
[2]Edge distance shall be sufficient to prevent splitting.
[3]Nail sizes and closest on-center spacing not specifically described in this table are outside the scope of this report.
[4]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.
[5]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 outside the scope of this report.
[6]16d sinkers (0.148-inch x 3 ¼ inches) may be spaced the same as a 12d common wire nail (0.148-inch x 3 ¼ inches).
[7]Multiple rows must be spaced ½ inch or more from each other and offset one-half of the tabulated minimum nail spacing. Multiple rows must be equally spaced about the centerline of the edge or face (whichever applies).
[8]Nail penetration for edge nailing shall not exceed 2 inches for 16d common nails (0.162-inch x 3 ½ inches) and 2 ½ inches for all nails with a smaller shank diameter.
[9]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.
[10]For product trademarked with 1047 (Burlington, WA) minimum nail spacing is permitted to be 3 inches.
[11]For product trademarked with 1066 (Golden, BC) or 1071 (Wilmington, NC) minimum nail spacing is permitted to be 3 inches.
[12]For product trademarked with 1047 (Burlington, WA) minimum end distance is permitted to be reduced to 2 ½ inches for single row nailing. For product trademarked with 1066 (Golden, BC) or 1071 (Wilmington, NC) minimum end distance is permitted to be 2 ½ inches.
[13]For product trademarked with 1066 (Golden, BC) or 1071 (Wilmington, NC) minimum nail spacing is permitted to be 4 inches.
[14]For product trademarked with 1047 (Burlington, WA) minimum nail spacing may be reduced to 5 inches when the member is at least 1 ¾ inches thick. For product trademarked with 1066 (Golden, BC) or 1071 (Wilmington, NC) minimum nail spacing is permitted to be 5 inches.

**TABLE 4 – EQUIVALENT SPECIFIC GRAVITY FOR CONNECTION DESIGN IN PWT™ LVL[1, 2, 3]**

| Nails | | Nails and Wood Screws | | Bolts and Lag Screws[6] | |
|---|---|---|---|---|---|
| Withdrawal Load | | Lateral Load | | Lateral Load | |
| | | | | Installed in Face[5] | |
| Installed in Edge[4] | Installed in Face[5] | Installed in Edge[4] | Installed in Face[5] | Loaded Parallel to Grain | Loaded Perpendicular to Grain |
| 0.46 | 0.50 | 0.50 | 0.50 | 0.46 | 0.50 |

[1]Fastener types and orientation not specifically described in this table are beyond the scope of this report.
[2]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.
[3]Fastener spacing, and end and edge distances must be as specified in the NDS, except that nail spacing and end distance must be as specified in Table 3.
[4]Edge orientation applies to member faces showing the narrow edge of all veneers, typically the narrow faces of the member.
[5]Face orientation applies to member faces showing the face of one veneer, typically the wide faces of the member.
[6]The capacities for lag screws installed into PWT™ LVL used as rim board for ledger attachment shall be in accordance with Table 2.

**TABLE 5 – STRENGTH REDUCTION FACTORS FOR NOTCHES AND HOLES IN PWT™ LVL USED AS STUDS[1, 2, 3]**

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

[1]Design of PWT™ LVL used as studs with notches and holes used in engineered wall framing must be based on a net-section analysis in accordance with the NDS. See Section 4.3.2 of this report for limitations on the allowed size and placement of notches and holes.
[2]The reference design values for bending, axial compression, and axial tension from Table 1 must be multiplied by the strength reduction factors given above for studs with notches or holes in engineered wall framing.
[3]See Section 4.3.2 for notching and boring of holes in PWT LVL used as studs in prescriptive wall framing.

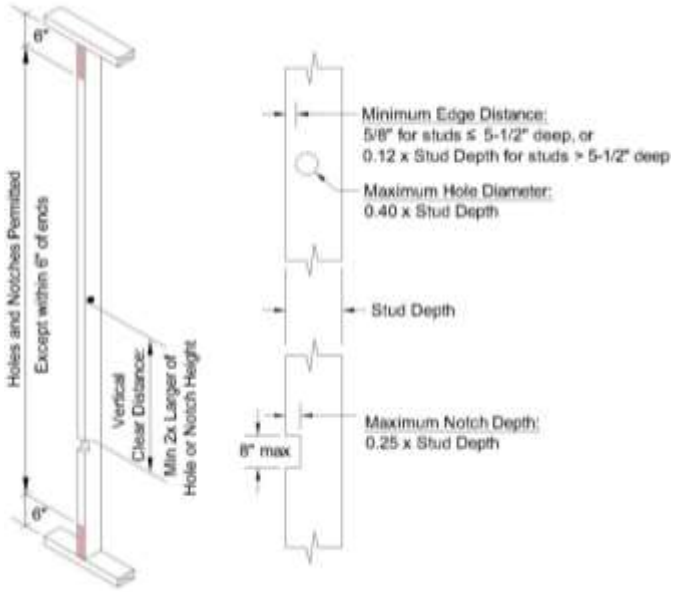


**FIGURE 2 – NOTCHING AND BORING REQUIREMENTS FOR PWT™ LVL STUDS IN ENGINEERED APPLICATIONS**

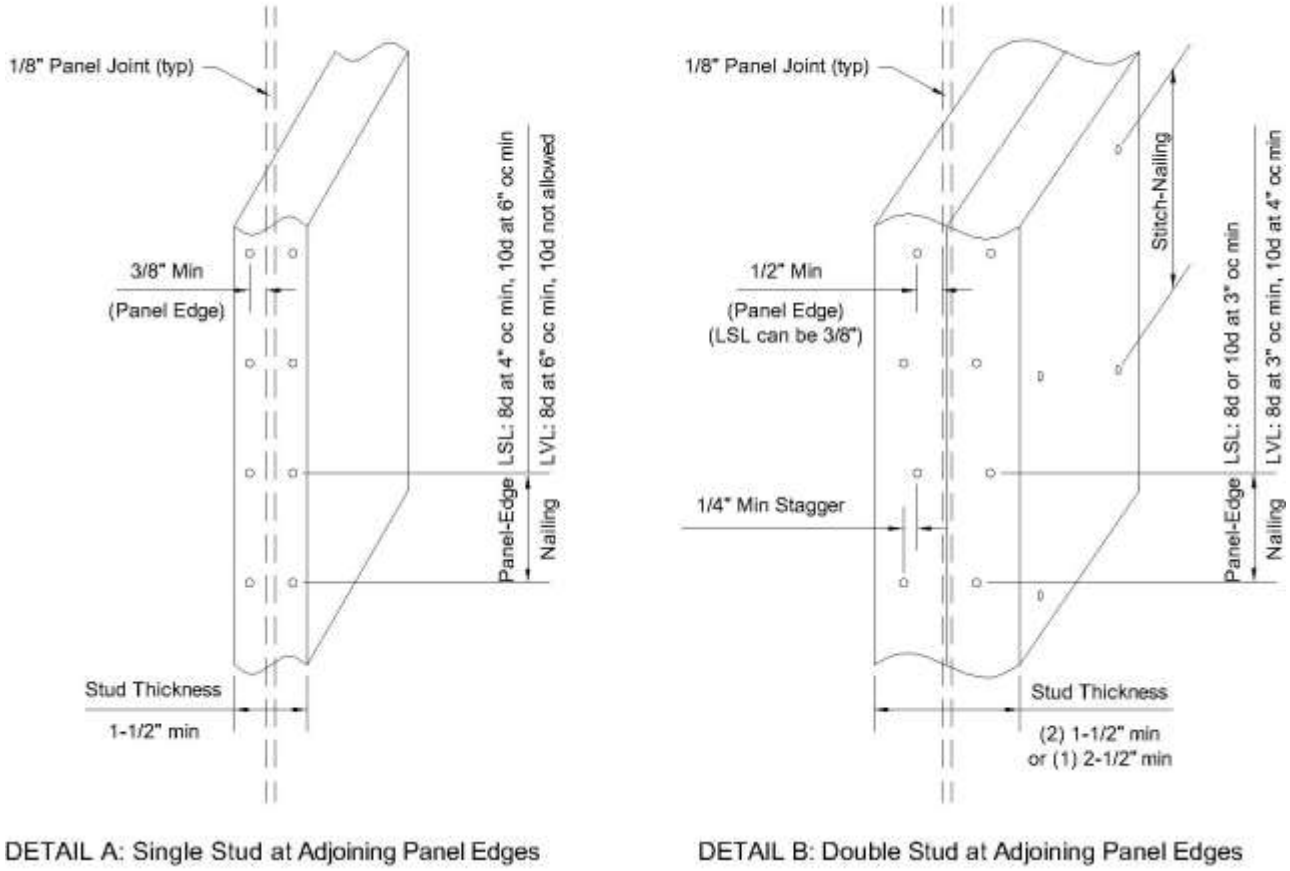


**FIGURE 3 – PANEL EDGE NAILING REQUIREMENTS FOR PWT™ LVL STUDS**

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**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**
**Section: 06 17 13—Laminated Veneer Lumber**

**REPORT HOLDER:**

**PACIFIC WOODTECH CORPORATION**

**EVALUATION SUBJECT:**

**PWT™ LAMINATED VENEER LUMBER (LVL), PWT™ TREATED LVL AND PWT™ RIM BOARDS**

## 1.0 REPORT PURPOSE AND SCOPE

**Purpose:**

The purpose of this evaluation report supplement is to indicate that PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards, described in ICC-ES evaluation report ESR-2909, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

**Applicable code editions:**

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

## 2.0 CONCLUSIONS

The PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards described in Sections 2.0 through 7.0 of the evaluation report ESR-2909, comply with the LABC Chapter 23, and the LARC, and are subjected to the conditions of use described in this supplement.

## 3.0 CONDITIONS OF USE

The PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-2909.
- The design, installation, conditions of use and identification are in accordance with the 2021 *International Building Code®* (IBC) and 2021 *International Residential Code®* (IRC) provisions, as applicable, noted in the evaluation report ESR-2909.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.

This supplement expires concurrently with the evaluation report, reissued September 2023 and revised August 2024.

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**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**
**Section: 06 17 13—Laminated Veneer Lumber**

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**PACIFIC WOODTECH CORPORATION**

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**PWT™ LAMINATED VENEER LUMBER (LVL), PWT™ TREATED LVL AND PWT™ RIM BOARDS**

## 1.0 REPORT PURPOSE AND SCOPE

**Purpose:**

The purpose of this evaluation report supplement is to indicate that PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards, described in ICC-ES evaluation report ESR-2909, have also been evaluated for compliance with the code*(s)* noted below.

**Applicable code editions:**

- 2022 *California Building Code*® (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2022 *California Residential Code*® (CRC)

## 2.0 CONCLUSIONS

### 2.1 CBC:

The PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards, described in Sections 2.0 through 7.0 of the evaluation report ESR-2909, comply with CBC Chapter 23, provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report, ESR-2909, and the additional requirements of CBC Chapters 16 and 17, as applicable.

#### 2.1.1 OSHPD:

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

#### 2.1.2 DSA:

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

### 2.2 CRC:

The PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards, described in Sections 2.0 through 7.0 of the evaluation report ESR-2909, comply with CRC Chapters 5 and 8, provided the design and installation are in accordance with the 2021 *International Residential Code*® (IRC) provisions noted in the evaluation report ESR-2909.

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**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**
**Section: 06 17 13—Laminated Veneer Lumber**

**REPORT HOLDER:**

**PACIFIC WOODTECH CORPORATION**

**EVALUATION SUBJECT:**

**PWT™ LAMINATED VENEER LUMBER (LVL), PWT™ TREATED LVL AND PWT™ RIM BOARDS**

## 1.0 REPORT PURPOSE AND SCOPE

**Purpose:**

The purpose of this evaluation report supplement is to indicate that PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards, described in ICC-ES evaluation report ESR-2909, have also been evaluated for compliance with the codes noted below.

**Applicable code editions:**

- 2023 *Florida Building Code—Building*
- 2023 *Florida Building Code—Residential*

## 2.0 CONCLUSIONS

The PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards, described in Sections 2.0 through 7.0 of the evaluation report ESR-2909, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*. The design requirements must be determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in evaluation report ESR-2909 for the 2021 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the PWT™ Laminated Veneer Lumber (LVL), PWT™ Treated LVL and PWT™ Rim Boards for compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential* has not been evaluated, and is outside the scope of this evaluation report supplement.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

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