# APA PRODUCT REPORT®

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## Murphy Laminated Veneer Lumber — PR-L283
## Murphy Engineered Wood Division — Revised January 24, 2018

Product: 2250$F_b$-1.5E, 2600$F_b$-1.7E, 2750$F_b$-1.8E, 2850$F_b$-1.9E, 2950$F_b$-2.0E, 3100$F_b$-2.0E, and 3100$F_b$-2.2E Murphy LVL

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1. Basis of the product report:
   - 2018, 2015, and 2012 International Building Code (IBC): Sections 104.11 Alternative material and 2303.1.10 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: Section R104.11 Alternative materials, and R502.1.7, R602.1.4, and R802.1.6 Structural composite lumber
   - ASTM D5456-14b, D5456-13, and D5456-09 recognized by the 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
   - APA Reports T2008P-10, T2008P-31, T2008P-43, T2008P-113, T2009P-12, T2009P-15, T2010P-02, T2010P-33, T2012P-03, T2015P-14, and T2015P-16, and other qualification data

2. Product description:
   Murphy laminated veneer lumber (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. Murphy LVL is available with thicknesses up to 7 inches, widths up to 24 inches, and lengths up to 80 feet.

3. Design properties:
   Table 1 lists the design properties, Table 2 lists the equivalent specific gravities for connection design, and Table 3 lists the allowable nail spacing for Murphy LVL. The allowable spans for Murphy LVL shall be determined based on the information provided in this report and/or based on recommendations provided by the manufacturer (www.murphyplywood.com/pdfs/engineered/Murphy_LVL_Technical_Guide.pdf).

4. Product installation:
   Murphy LVL shall be installed in accordance with the engineering drawing approved by the engineer of record and/or recommendations provided by the manufacturer. Permissible details and allowable hole sizes shall be in accordance with the engineering drawing and/or recommendations provided by the manufacturer.

5. Fire-rated assemblies:
   The provisions of 2018 and 2015 IBC Section 722 Calculated Fire Resistance, and 2012 IBC Section 722.6.3 Design of fire-resistant exposed wood members shall be applicable to Murphy LVL. Fire-rated assemblies shall be constructed in accordance with the recommendations provided by APA Design/Construction Guide: *Fire-Rated Systems*, Form W305 (www.apawood.org/resource-library) and the manufacturer.

6. Limitations:
   a) Murphy LVL shall be designed in accordance with the code using the design properties specified in this report.

 

b) Murphy LVL is limited to dry service conditions where the average equilibrium moisture content of sawn lumber is less than 16 percent.
c) Murphy LVL is produced at the Murphy Engineered Wood Division facilities in Sutherlin, Oregon under a quality assurance program audited by APA.
d) This report is subject to re-examination in one year.

7. Identification:
Murphy LVL described in this report is identified by a label bearing the manufacturer's name (Murphy Engineered Wood Division) and/or trademark, the APA assigned plant number (1089), the LVL grade, the APA logo, the report number PR-L283, and a means of identifying the date of manufacture.

 

Table 1. Design Properties (Allowable Stress Design) for Murphy LVL [a,b]

| Property | | Design Stress (psi) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2250$F_b$-1.5E | 2600$F_b$-1.7E | 2750$F_b$-1.8E | 2850$F_b$-1.9E | 2950$F_b$-2.0E | 3100$F_b$-2.0E | 3100$F_b$-2.2E |
| Bending ($F_b$) [c] | Joist [d] | 2,250 | 2,600 | 2,750 | 2,850 | 2,950 | 3,100 | 3,100 |
| | Plank [e] | 2,250 | 2,600 | 2,750 | 2,800 | 2,950 | 3,100 | 3,100 |
| Tension parallel to grain ($F_t$) [f] | | 1,350 | 1,950 | 1,950 | 1,950 | 2,100 | 2,100 | 2,100 |
| Longitudinal shear ($F_v$) | Joist | 285 | 285 | 285 | 285 | 290 | 290 | 290 |
| | Plank | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Compression parallel ($F_{c\|\|}$) | | 2,350 | 2,350 | 2,350 | 2,350 | 3,200 | 3,200 | 3,200 |
| Compression perpendicular ($F_{c\perp}$) | Joist | 750 | 750 | 750 | 750 | 750 | 750 | 750 |
| | Plank | 450 | 450 | 450 | 550 | 550 | 550 | 550 |
| Modulus of Elasticity (E) | Joist | 1.50 x $10^{6}$[g] | 1.70 x $10^{6}$[g] | 1.80 x $10^{6}$[g] | 1.90 x $10^{6}$[g] | 2.00 x $10^{6}$[g] | 2.00 x $10^{6}$[g] | 2.20 x $10^{6}$[h] |
| | Plank | 1.40 x $10^{6}$[g] | 1.70 x $10^{6}$[g] | 1.80 x $10^{6}$[g] | 1.90 x $10^{6}$[g] | 2.00 x $10^{6}$[g] | 2.00 x $10^{6}$[g] | 2.20 x $10^{6}$[h] |

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

[a] The tabulated values are design values for normal duration of load. All values, except for E and $F_{c\perp}$, are permitted to be adjusted for other load durations as permitted by the code. The design stresses are limited to conditions in which the maximum moisture content of lumber is less than 16 percent.

[b] Joist = load parallel to glueline. Plank = load perpendicular to glueline.

[c] Tabulated flexural stress ($F_b$) may be increased by 4 percent when the member qualifies as a repetitive member as defined in the NDS.

[d] The tabulated values are based on a reference depth of 12 inches. For other depths, when loaded edgewise, the allowable bending stress ($F_b$) shall be modified by $(^{12}/_{d})^{0.18}$, as shown in the following table. For depths less than 2-1/2 inches, the factor for the 2-1/2-inch depth shall be used.

| Depth (in.) | 2-1/2 | 3-1/2 | 5-1/2 | 7-1/4 | 9-1/4 | 11-1/4 | 12 | 16 | 18 | 20 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Multiply by | 1.33 | 1.25 | 1.15 | 1.09 | 1.05 | 1.01 | 1.0 | 0.95 | 0.93 | 0.91 | 0.88 |

[e] For face-bonded multiple-layer LVL up to 7 inches in depth, the allowable bending stress ($F_b$) in plank orientation shall be modified by $(^{1.75}/_{d})^{0.25} \le 1.0$.

[f] The tabulated values are based on a reference length of 3 feet. For other lengths, the allowable tensile stress shall be modified by $(3/\lambda)^{0.11}$, where $\lambda$ = length in feet. For lengths less than 3 feet, use the allowable tension stresses in Table 1 unadjusted.

[g] The tabulated modulus of elasticity of Murphy LVL, except as noted in Footnote (h), is the apparent MOE, which includes the effects of shear deformation. When calculating deflection, standard engineering formulae for pure bending deflection are sufficient, and the second term of Equation 1 in Footnote (h) may be ignored.

[h] The tabulated modulus of elasticity for the 3100$F_b$-2.2E grade of Murphy LVL is the shear-free MOE. For uniformly loaded simple-span beams deflection is calculated as follows:

$$\delta = \frac{270wL^4}{Ebh^3} + \frac{28.8wL^2}{Ebh} \qquad \text{[Eq. 1]}$$

Where: $\delta$ = estimated deflection, inches, w = uniform load, plf
L = span, feet, E = tabulated modulus of elasticity, psi
b = beam width, inches, and h = beam depth, inches

 

Table 2. Fastener Design for Murphy LVL [a,b]

| Equivalent Specific Gravity (S.G.) | | | | |
|---|---|---|---|---|
| Nails | | | | Bolts |
| Withdrawal Load | | Lateral Load | | Lateral Load |
| Installed in Edge | Installed in Face | Installed in Edge | Installed in Face | Installed in Face |
| 0.49 | 0.50 | 0.50 | 0.50 | 0.50 |

[a] Fastener values based on the equivalent specific gravities in the above table are for normal load duration and shall be permitted to be adjusted using the load duration factors in accordance with the code.
[b] The bolt edge distance when loaded parallel and perpendicular to the grain shall be a minimum of four times the bolt diameter.

Table 3. Minimum Allowable Nail Spacings for Murphy LVL[a]

| Thickness (in.) | Orientation | Nail Size[b,c] (Common or Box) | Minimum End Distance (in.) | Minimum Nail Spacing (in.) | |
|---|---|---|---|---|---|
| | | | | Single Row | Multiple Rows[d,e] |
| 1-1/4 ≤ thickness < 1-1/2 | Edge[f] | 8d & smaller | 2-1/2 | 4 | NR[h] |
| | | 10d & 12d | 2-1/2 | 4 | |
| | | 16d | 3-1/2 | 5 | |
| | Face[g] | 8d & smaller | 1-1/2 | 3 | 3 |
| | | 10d & 12d | 1-1/2 | 3 | 3 |
| | | 16d | 1-1/2 | 5 | 5 |
| ≥ 1-1/2 | Edge[f] | 8d & smaller | 2-1/2 | 3 | 4 |
| | | 10d & 12d | 3-1/2[i] | 4 | 5 |
| | | 16d | 3-1/2 | 5 | 6[j] |
| | Face[g] | 8d & smaller | 1-1/2 | 3 | 3 |
| | | 10d & 12d | 1-1/2 | 3 | 3 |
| | | 16d | 1-1/2 | 5 | 5 |

For SI: 1 inch = 25.4 mm.

[a] Edge distance shall be sufficient to prevent splitting.
[b] 16d sinkers (0.148” x 3-1/4”) may be spaced the same as a 12d common wire nail (0.148” x 3-1/4”).
[c] Fastener sizes and closest on-center spacing not specifically described above are beyond the scope of this report.
[d] Multiple rows in the edge orientation must be spaced 1/2 inch or more from each other and offset one-half of the tabulated minimum nail spacing, as shown in Figure 1.
[e] Multiple rows must be equally spaced from the centerline of the narrow face axis.
[f] Nail penetration for edge nailing shall not exceed 2 inches for 16d nails (common or box) and 2-1/2 inches for 10d and 12d nails (common or box).
[g] 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.
[h] Not recommended.
[i] Minimum end distance may be reduced to 2-1/2 inches for single row nailing.
[j] Minimum nail spacing may be reduced to 5 inches when the LVL is 1-3/4 inches or thicker.

 

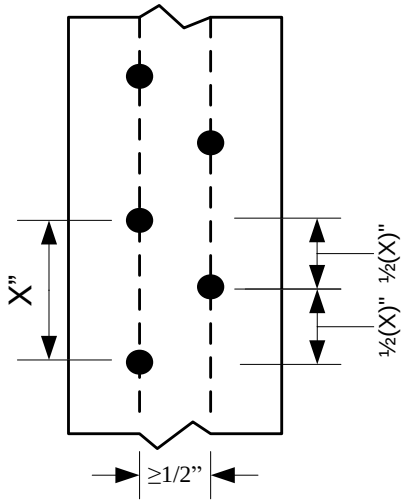


Figure 1. Spacing of multiple rows of nails.

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