APA PRODUCT REPORT®
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LP® SolidStart® Laminated Strand Lumber and Laminated Veneer Lumber
Louisiana-Pacific Corporation

PR-L280

Revised July 26, 2018

Products: LP SolidStart 1.35E, 1.55E, and 1.75E LSL
LP SolidStart 1750F_b-1.3E LVL Rim Board
LP SolidStart 2250F_b-1.5E, 2400F_b-1.7E, 2650F_b-1.9E, 2900F_b-2.0E, 2950F_b-2.0E, 3100F_b-2.1E, and 3100F_b-2.2E LVL

LP Building Products, Louisiana-Pacific Corporation, 414 Union Street, Suite 2000, Nashville, Tennessee 37219
(615) 986-5600
customer.support@lpcorp.com
www.lpcorp.com

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 and 2009 IBC: Sections 104.11 Alternative materials and 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 and 2009 IRC: Section R104.11 Alternative materials, and 2012 IRC Sections R502.1.7, R602.1.4, and R802.1.6 Structural composite lumber
   - ASTM D5456-17, Standard Specification for Evaluation of Structural Composite Lumber Products
   - ASTM D5456-14b, ASTM D5456-13, ASTM D5456-09, and ASTM D5456-05a recognized by the 2018 IBC and IRC, 2015 IBC and IRC, 2012 IBC and IRC, and 2009 IBC, respectively
   - ASTM D7672-14 and ASTM D7672-12 recognized by the 2018 IBC and IRC, and 2015 IBC and IRC, respectively
   - ANSI/APA PRR 410-2016 and ANSI/APA PRR 410-2011 recognized by the 2018 IBC and IRC, and 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 and 2009 IBC
   - PFS Corporation Test Reports (Louisiana-Pacific Corporation, Golden, BC): 1750F_b - 1.3E, 2250F_b - 1.5E Douglas-fir LVL, 2250F_b - 1.5E Lodgepole pine LVL, 2650F_b - 1.9E Douglas-fir LVL, 2650F_b - 1.9E Lodgepole pine LVL, 2950F_b - 2.0E Douglas-fir LVL
   - APA Reports T2005P-76A, T2006P-06, T2006P-25A, T2006P-26, T2007P-89, T2008P-10, T2008P-13, T2008P-31, T2008P-39, T2008P-43, T2008P-46A, T2008P-49A, T2008P-55, T2008P-66, T2008P-85, T2008P-86, T2008P-94A, T2008P-106B, T2008P-112, T2008P-113A, T2009P-04B, T2009P-05, T2009P-12, T2009P-13, T2009P-25, T2009P-26, T2009P-64, T2009P-84, T2010P-14, T2010P-16, T2010P-18, T2010P-19, T2010P-24, T2010P-25, T2011Q-14A, T2011P-24, T2011P-30, T2011P-68, T2012P-08, T2012P-20, T2013P-15, T2013P-17, T2013P-19, T2014P-16, T2014P-26A, T2014P-27A, T2014P-28, T2014P-48, T2017P-09, T2017P-23, and T2018P-04, and other qualification data

2. Product description:

2.1 LP SolidStart Laminated Strand Lumber (LSL)

LP SolidStart LSL is made with strands of various species and strand classifications in accordance with the in-plant manufacturing standard approved by APA.

The LSL may be treated with an EPA-registered zinc borate for decay and termite resistance to a retention level equivalent to that specified in American Wood Protection Association (AWPA) Standard T1 for Use Category 2 (UC2). When treated, the LSL is designated as LP SolidGuard® LSL. The efficacy of the preservative treatment of the LP SolidGuard LSL is outside the scope of this report and the APA certification program. For the purposes of this report, the designations of LP SolidStart LSL and LP SolidGuard LSL can be used interchangeably.

LP SolidStart LSL is available with thicknesses up to 5-1/4 inches, and a range of widths and lengths. Refer to the manufacturer's technical guide (https://lpcorp.com/resources/product-literature/) and a local LP Engineered Wood Products distributor for product availability.

LP SolidStart LSL can also be used as wall framing in conventional light-frame construction of the applicable code and in engineered wall systems. The minimum thickness of the LSL for wall framing is 1-1/2 inches.

LP SolidStart LSL may be used as rim board with a minimum thickness of 1-1/8 inches.

2.2 LP SolidStart Laminated Veneer Lumber (LVL)
LP SolidStart 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. LP SolidStart LVL is available with thicknesses up to 3-1/2 inches, and a range of widths and lengths. LP SolidStart LVL "Billet Beams" are fabricated by face-laminating primary thicknesses, and are available in thicknesses of 3-1/2, 5-1/4 or 7 inches. Refer to the manufacturer's technical guide (see link above) and a local LP Engineered Wood Products distributor for product availability.

LP SolidStart LVL having a grade of 1.5E or greater can also be used as wall framing in conventional light-frame construction of the applicable code and in engineered wall systems. The minimum thickness of the LVL for wall framing is 1-1/2 inches.

LP SolidStart LVL Rim Board is LP LVL with two or more veneers oriented 90 degrees (cross-ply) to the length. LP LVL Rim Board is available with a minimum thickness of 1-1/4 inches, and may be used for all applications applicable to LP LVL except wall framing.

3. Design properties:
Table 1 lists the design properties, Table 2 lists the equivalent specific gravities for fastener design, Table 3 lists the allowable loads for rim boards, and Table 4 lists the allowable nail spacing for LP SolidStart LSL and LVL.

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

3.2 Wall framing:

3.2.1 Prescriptive Stud Wall Applications: LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL used as studs in conventional construction are permitted in accordance with Sections 2308.5.9 and 2308.5.10 of the 2018 and 2015 IBC, Sections 2308.9.10 and 2308.9.11 of the 2012 and 2009, and Section R602.6 of the 2018 through 2009 IRC.

3.2.2 Engineered Stud Wall Applications: LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL shall be permitted in engineered wall applications when designed based on net section analysis in accordance with the National Design Specification for Wood Construction (NDS) and the restrictions specified in Section 4.3.2. The allowable design stress for bending, axial compression, and axial tension shall be multiplied by the strength reduction factors in Table 5 to account for stress concentrations in notches and holes.

The allowable shear values for nailed wood structural panel shear walls using LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL as the wall studs shall be determined using Table 4.3A of 2015 and 2008 SPDWS where the LP SolidStart LSL and LVL shall be considered to be equivalent to sawn lumber studs with a specific gravity of 0.50, when subjected to the nailing restrictions specified in Section 4.3.3 of this report.

4. Product installation:

4.1 Beams and headers:
LP SolidStart LSL and 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 LP SolidStart LSL and 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 strands in LP SolidStart LSL and the veneers in LP SolidStart LVL.

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

4.3 Wall framing:

4.3.1 Prescriptive stud wall applications: Cutting, notching and boring of LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL used as studs in conventional construction is permitted in accordance with Sections 2308.5.9 and 2308.5.10 of the 2018 and 2015 IBC, Sections 2308.9.10 and 2308.9.11 of the 2012 and 2009 IBC, and Section R602.6 of the 2018 through 2009 IRC. Stud wall nailing restrictions and requirements are presented in Section 4.3.3 of this report.

4.3.2 Engineered stud wall applications: Cutting, notching and boring of LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL shall be permitted in engineered wall applications with the following restrictions:

a) Holes up to 40% of the stud depth are allowed anywhere in the stud height for bearing walls, except that a hole shall not be placed within 6 inches of either end of the stud. A minimum edge distance of 5/8 inch shall be maintained for all holes for stud depths of 5-1/2 inches (i.e., nominal 2x6) or less. For larger depths, a minimum edge distance of 12% of the stud depth shall be maintained for all holes.

b) Notches up to 25% of the stud depth are allowed anywhere in the stud height, except that a notch shall not be placed within 6 inches of either end of the stud. The notch length shall not exceed 8 inches.

c) Holes and notches shall not be cut at the same cross section, and the minimum clear vertical space between hole and notch shall be 2 times the hole diameter or 2 times the notch length, whichever is greater.

d) Stud wall nailing restrictions and requirements are presented in Section 4.3.3.

4.3.3 Stud wall nailing restrictions and requirements

a) LP SolidStart LSL Studs

- For sheathing attached with 10d common nails (0.148 inch x 3 inches) with a spacing no closer than 6 inches on center, a single LP SolidStart LSL stud shall be permitted for framing at adjoining panel edges. Nails shall be installed a minimum 3/8 inch from all panel edges.
- For sheathing attached with 8d common nails (0.131 inch x 2-1/2 inches) or smaller with a spacing no closer than 4 inches on center, a single LP SolidStart LSL stud shall be permitted for framing at adjoining panel edges. Nails shall be installed a minimum 3/8 inch from all panel edges.
- For sheathing attached with 8d common nails (0.131 inch x 2-1/2 inches) spaced closer than 4 inches on center or 10d common nails (0.148 inch x 3 inches) spaced closer than 6 inches on center, a double, stitch-nailed, LSL stud or single 2-1/2 inch thick LSL stud is required at adjoining panel edges. Nails shall be installed a minimum 3/8 inch from all panel edges and shall be staggered a minimum of 1/4 inch for each row of nails.

b) LP SolidStart 1.5E or greater LVL Studs

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

c) For stud wall applications in accordance with the IRC and the conventional light-frame construction provisions of the IBC [Sections 2308, Table 2304.10.1 (2018 and 2015 IBC), and Table 2304.9.1 (2012 and 2009 IBC)], double LSL and LVL studs shall be stitch-nailed together with 2 staggered rows of nails (minimum 0.120 inch x 2-7/8 inches) spaced 8 inches in each row. For engineered stud wall applications, the stitch nailing of double LSL and LVL studs shall be designed to transfer the required lateral shear using an assumed equivalent specific gravity of 0.50.

d) Nails shall not be spaced closer than 3 inches on center.

e) Maximum nail size is 10d common (0.148 inch x 3 inches).

4.4 Rim board:

4.4.1 LP SolidStart LSL or LP SolidStart LVL rim boards shall be installed in accordance with the recommendations provided by the manufacturer (see link above) and the code.

5. Fire-rated assemblies:

5.1 Design of fire-resistant exposed wood members in accordance with Chapter 16 of the NDS, Section 722.1 of the 2018 and 2015 IBC, Section 722.6.3 of the 2012 IBC, or Section 721.6.3 of the 2009 IBC shall be applicable to LP SolidStart LSL and LVL. Fire-rated assemblies shall be constructed in accordance with the recommendations provided by APA *Fire-Rated Systems*, Form W305 (www.apawood.org/resource-library), and the manufacturer.

5.2 When used as joists/rafters, LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL are permitted to be used as direct replacement for solid-sawn lumber having the same dimensions, in any fire-resistance-rated floor/roof assemblies listed in Table 721.1(3) of the 2018, 2015, and 2012 IBC or Table 720.1(3) of the 2009 IBC.

5.3 The provisions of Section R302.13, Exception 4 of the 2018 and 2015 IRC and Section R501.3, Exception 4 of the 2012 IRC for fire protection of floors shall be applicable to floor assemblies constructed with LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL with a nominal 2x10 dimension (i.e., 1-1/2 inches by 9-1/4 inches net dimension) or greater.

5.4 When used as wall studs, LP SolidStart LVL having a grade of 1.5E or greater, and LP SolidStart LSL are permitted to be used as a direct replacement for solid-sawn lumber of No. 2 or lower grades, having the same dimensions, in any fire-resistance-rated wall assemblies listed in Table 721.1(2) of the 2018, 2015, and 2012 IBC or Table 720.1(2) of the 2009 IBC. A minimum of 2.5 lbf/ft^3 mineral wool insulation shall be placed in the stud cavity.

5.5 As an alternative to the prescriptive fire-resistance-rated wall assemblies listed in Table 721.1(2) of the 2018, 2015, and 2012 IBC or Table 720.1(2) of the 2009 IBC, a one-hour fire-resistance-rated wall assembly shall be permitted to be designed and constructed with the limitations listed below, provided that the applied axial stress on each stud does not exceed 440 psi for 1.75E and 1.55E LP SolidStart LSL, 380 psi for 1.35E LP SolidStart LSL, and 550 psi for LP SolidStart 1.5E or greater LVL. When the slenderness ratio exceeds 33, the F_c', which is the $F_{c||}$ value tabulated in Table 1 for each stud grade adjusted for all applicable adjustment factors, including column stability factor, in accordance with NDS, shall be multiplied by 0.77 for LP SolidStart LSL and 0.63 for LP SolidStart LVL having a grade of 1.5E or greater.

a) The stud spacing shall be no greater than 24 inches on center,
b) The top and bottom plates of the wall shall be constructed in accordance with the nailing schedule specified in Table 2304.10.1 of the 2018 and 2015 IBC, Table 2304.9.1 of the 2012 and 2009 IBC or Table R602.3(1) of the 2018 through 2009 IRC.
c) The wall shall be covered with one layer of 5/8-inch Type X gypsum wall board attached to studs with 2-1/4-inch long Type S drywall screws at 7 inches on center on the perimeter and in the field, and
d) A minimum of 2.5 lbf/ft^3 mineral wool insulation shall be placed in the stud cavity.

Exception: For the purpose of one-hour fire-resistance-rated wall assemblies, 1.75E LP SolidStart LSL shall be designed using the properties of, and subjected to the same limitations as 1.55E LP SolidStart LSL.

6. Limitations:
   a) LP SolidStart LSL and LVL shall be designed in accordance with the code using the design properties and installation requirements specified in this report.
   b) LP SolidStart LSL and LVL is limited to dry service conditions where the equivalent moisture content of sawn lumber is less than 16 percent.
   c) LP SolidStart LSL and LP SolidGuard LSL are produced by Louisiana-Pacific Corporation facility in Houlton, Maine under a quality assurance program audited by APA.
   d) The efficacy of the preservative treatment of the LP SolidGuard LSL is outside the scope of this report and the APA certification program.
   e) LP SolidStart LVL is produced at the Louisiana-Pacific Corporation facilities in Wilmington, North Carolina, Golden, British Columbia, Canada and the Murphy

Engineered Wood Division facilities in Sutherlin, Oregon under a quality assurance program audited by APA. A list of the LVL grades manufactured at different LP and Murphy facilities is maintained by APA for independent auditing purposes.

f) This report is subject to re-examination in one year.

7. Identification:
The LP SolidStart LSL and LVL described in this report are identified by a label bearing the manufacturer's name (Louisiana-Pacific Corporation) and/or trademark, the APA assigned plant number (1092 for the Houlton plant, 1071 for the Wilmington plant, 1066 for the Golden plant, and 1089 for the Sutherlin plant), the product type and grade, the APA logo, the report number PR-L280, and a means of identifying the date of manufacture.

Table 1. Design Properties (Allowable Stress Design) for LP SolidStart LSL and LVL[a,b]

Property		LP SolidStart LSL			LP SolidStart LVL Rim Board (cross-ply)	LP SolidStart LVL						
		1.35E	1.55E	1.75E	1750F_b-1.3E	2250F_b-1.5E	2400F_b-1.7E	2650F_b-1.9E	2900F_b-2.0E	2950F_b-2.0E	3100F_b-2.1E	3100F_b-2.2E
Bending (F_b)[c], psi	Joist	1,730[d]	2,360[d]	2,500[d]	1,750[e]	2,250[f]	2,400[f]	2,650[f]	2,900[f]	2,950[f]	3,100[f]	3,100[f]
	Plank	1,910	2,620	2,800	1,750	2,200[g]	2,300[g]	2,600[g]	2,950[g]	2,950[g]	3,100[g]	2,950[g]
Tension parallel to grain (F_t), psi		1,300[h]	1,750[h]	2,100[h]	1,200[j]	1,350[i,j]	1,350[j]	1,600[i,j]	1,800[i,j]	1,800[i,j]	1,800[i,j]	1,800[i,j]
Longitudinal shear (F_v), psi	Joist	410	410	410	250	285	285	285	285	290	290	290
	Plank	155	155	155	140	140	140	140	140	140	140	140
Compression parallel ($F_{c\|\|}$), psi		1,650	2,175	2,450	1,700	2,350	2,350	2,350	3,200	3,200	3,200	3,200
Compression perpendicular ($F_{c\perp}$)[m], psi	Joist	750	875	950	680	750	750	750	750	750	750	750
	Plank[n]	685	775	890	550							
Modulus of Elasticity (E), 10^6 psi	Joist	1.35[k]	1.55[k]	1.75[k]	1.30[k]	1.50[k]	1.70[k]	1.90[l]	2.00[k]	2.00[l]	2.10[k]	2.20[k]
	Plank	1.35[k]	1.55[k]	1.75[k]	1.30[k]	1.40[k]	1.70[k]	1.80[l]	2.00[k]	2.00[l]	2.00[k]	2.20[k]

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 equivalent moisture content of sawn lumber does not exceed 16 percent.

[b] Allowable stresses for "Joist" refer to loads applied parallel to the wide face of the strands (the edge of the member). "Plank" refers to loads applied perpendicular to the wide face of the strands (the face of the member).

[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 for LP SolidStart LSL 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 $(^{12}/_{d})^{0.120}$. For depths less than 3-1/2 inches, the factor for the 3-1/2-inch depth shall be used.

[e] The tabulated value for LP LVL Rim Board (with cross plies) is based on a reference depth of 12 inches. For other depths, when loaded edgewise, the allowable bending stress (F_b) shall be modified by $(12/d)^{0.261}$. For depths less than 3-1/2 inches, the factor for the 3-1/2-inch depth shall be used.

[f] The tabulated values for LP SolidStart LVL are based on a reference depth of 12 inches. For depths greater than 12 inches, multiply F_b by $(12/d)^{0.143}$. For depths less than 12 inches, multiply F_b by $(12/d)^{0.111}$. For depths less than 3-1/2 inches, the factor for the 3-1/2-inch depth shall be used.

[g] For LP SolidStart LVL "Billet Beams" up to 7 inches in thickness (see Section 2.2), the allowable bending stress (F_b) in plank orientation shall be modified by $(1.75/d)^{0.25} \le 1.0$.

[h] The tabulated values for LP SolidStart LSL are based on a reference length of 3 feet. For other lengths, the allowable tensile stress shall be modified by $(3/\ell)^{0.092}$, where ℓ = length in feet. For lengths less than 3 feet, use the allowable tension stresses in Table 1 unadjusted.

[i] For LP SolidStart LVL 1-1/2 inches in thickness, the allowable tension parallel to grain (F_t) is as follows:

LP SolidStart LVL Grade	2250F_b-1.5E	2650F_b-1.9E	2900F_b-2.0E and higher
F_t (1-1/2-inch-thick LVL)	1,750	1,875	2,100

[j] The values for LP SolidStart LVL published in Table 1 and Footnote (i) are based on a reference length of 3 feet. For other lengths, the allowable tensile stress shall be modified by $(3/\ell)^{0.111}$, where ℓ = length in feet. For lengths less than 3 feet, use the allowable tension stresses in Table 1 or Footnote (i) unadjusted.

[k] The tabulated modulus of elasticity 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: δ = 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

(l) The tabulated modulus of elasticity 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 k may be ignored.

(m) When designing with the tabulated compressive stress perpendicular to grain ($F_{c\perp}$), the Bearing Area Factor (C_b) stipulated in Section 3.10.4 of the NDS shall be permitted to be applied.

(n) The tabulated compressive stress perpendicular to grain ($F_{c\perp}$) value is based on the average stress at the proportional limit or 0.04-in. deformation, whichever is less, in accordance with ASTM D5456-17.

Table 2. Fastener Design for LP SolidStart LSL and LVL[a,b,c]

Equivalent Specific Gravity (S.G.)					
Nails		Nails and Wood Screws		Bolts and Lag Screws[d,e]	
Withdrawal Load		Lateral Load		Lateral Load	
				Installed in Face	
Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Parallel to Grain	Perpendicular to Grain
LP SolidStart LSL					
0.46	0.50	0.50	0.55	0.50	0.58
LP SolidStart LVL Rim Board (cross-ply)					
0.46	0.50	0.50	0.50	0.46	0.50
LP SolidStart LVL					
0.46[f]	0.50	0.50	0.50	0.46[g]	0.50

[a] Fastener types and orientation not specifically described above 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 the NDS, except that nail spacing and end distance must be as specified in Table 4.
[d] Bolts and lag screws shall only be installed into the face (plank orientation) of the LSL and LVL.
[e] The capacities for 1/2" (12.7 mm) diameter lag screws installed into LP SolidStart LSL and LVL Rim Board for ledge attachment shall be in accordance with Table 3.
[f] The equivalent specific gravity value is permitted to be increased to 0.49 for LVL manufactured from the Sutherlin plant (Mill number 1089) in accordance with APA PR-L283.
[g] The equivalent specific gravity value is permitted to be increased to 0.50 for LVL manufactured from the Sutherlin plant (Mill number 1089) in accordance with APA PR-L283.

Table 3. Allowable Loads for LP SolidStart LSL and LVL Rim Boards[a]

Grade	Thickness (in.)	Lateral Load[b,c] (lbf/ft)	Vertical Uniform Load[d] (lbf/ft)		Vertical Concentrated Load (lbf)	Lateral Resistance for 1/2- inch-dia. Lag Screws (lbf)
			Depth ≤ 16”	16” < Depth ≤ 24”[e]	Depth ≤ 24”[e]	
LP SolidStart LSL						
1730Fb-1.35E and above	1-1/8 [f]	200	4,850	NA	3,500	400
	1-1/4 [g]	250	6,000	3,800	3,800	450
	≥ 1-1/2 [g]	280	7,000	4,500	4,500	475
LP SolidStart LVL Rim Board (cross-ply)						
1750F_b-1.3E	≥ 1-1/4	250	9,350	5,070	4,210	450
LP SolidStart LVL						
1.5E and above	1-1/2 ≤ t <1-3/4	250	4,000	2,500	2,700	450
	t ≥ 1-3/4	250	4,500	3,450	3,200	450

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf = 4.448 N, 1 lbf/ft = 14.6 N/m.

[a] The tabulated 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 applicable building code except that the vertical uniform load capacity and vertical concentrated load capacity are not permitted to be increased for any load durations shorter than the normal load duration (10 years).
[b] 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 2305.1.4 of the IBC.
[c] The nailing schedule for sheathing to rim and rim board to sill plate (toe-nailed) is based on 8d box (0.113” x 2-1/2”) nails at 6 inches on center (refer to APA W345, *APA Performance Rated Rim Boards*® for full details). 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 shown in this table. Calculations shall be based on the equivalent specific gravity values listed in Table 2 subjected to the nailing spacing provided in Table 4.
[d] 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.
[e] 1-1/8-inch thick LP SolidStart LSL is limited to a maximum depth of 16 inches for rim board applications.
[f] 1-1/8-inch thick LP SolidStart LSL meets or exceeds the performance requirements of Grade B2 Rim Boards specified in ANSI/APA PRR 410.
[g] 1-1/4-inch and thicker LP SolidStart LSL meets or exceeds the performance requirements of Grade A Rim Boards specified in ANSI/APA PRR 410.

Table 4. Minimum Allowable Nail Spacings for LP SolidStart LSL and LVL[a,b]

Thickness (in.)	Orientation[e]	Common Nail Size[f,g]	Minimum End Distance (in.)	Minimum Nail Spacing per Row (in.)	
				Single Row	Multiple Rows [c,d]
LP SolidStart LSL					
1" ≤ t < 1-1/4"	Edge[h]	8d & smaller	2	4	NA
		10d & 12d	2	4	
		16d	NA[j]	NA[j]	
	Face[i]	8d & smaller	7/8	1	1
		10d & 12d	7/8	1	1
		16d	7/8	1-1/2	1-1/2
1-1/4" ≤ t < 1-1/2"	Edge[h]	8d & smaller	2	4	NA
		10d & 12d	2	4	
		16d	2-1/2[k]	5[l]	
	Face[i]	8d & smaller	7/8	1	1
		10d & 12d	7/8	1	1
		16d	7/8	1-1/2	1-1/2
1-1/2" ≤ t < 1-3/4"	Edge[h]	8d & smaller	2	3	3
		10d & 12d	2	3	4
		16d	2-1/2[k]	4	6
	Face[i]	8d & smaller	7/8	1	1
		10d & 12d	7/8	1	1
		16d	7/8	1-1/2	1-1/2
≥ 1-3/4"	Edge[h]	8d & smaller	2	3	3
		10d & 12d	2	3	4
		16d	2-1/2[k]	3	6
	Face[i]	8d & smaller	7/8	1	1
		10d & 12d	7/8	1	1
		16d	7/8	1-1/2	1-1/2
LP SolidStart LVL					
< 1-1/2"	Edge[h]	8d & smaller	2-1/2	4	NA
		10d & 12d	2-1/2	4	
		16d	3-1/2	5	
	Face[i]	8d & smaller	1-1/2	3	3
		10d & 12d	1-1/2	3	3
		16d	1-1/2	5	5
≥ 1-1/2"	Edge[h]	8d & smaller	2-1/2	3	4[m]
		10d & 12d	2-1/2	4	5[m]
		16d	3-1/2	5	6[m,n]
	Face[i]	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] Spacing requirements and maximum nail size for panel edge nailing of wall sheathing at adjoining panels must be in accordance with Section 4.3.3.

[b] Edge distance shall be sufficient to prevent splitting.

[c] Multiple rows 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.

[d] Multiple rows must be equally spaced about the centerline of the edge or face (whichever applies).

[e] Face orientation applies to nails driven into the face of the LSL or LVL member, such that the long axis of the nail is perpendicular to the wide faces of the strands or veneers. Edge orientation applies to nails driven into the edge of the LSL or LVL member.

[f] 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").

[g] 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.

[h] Nail penetration for edge nailing shall not exceed 2 inches for 16d common nails (0.162" x 3-1/2") and 2-1/2 inches for all nails with a smaller shank diameter.

[i] Tabulated closest on-center spacing for face orientation is applicable to nails that are installed in rows parallel to the grain (length) of the LSL or LVL. For nails installed in rows perpendicular to the direction of grain (width/depth) of the LSL or LVL, the closest on-center spacing for face orientation shall be sufficient to prevent splitting of the LSL or LVL.

[j] For LSL thicknesses of 1-1/8 inches or greater, 16d common nails (0.162" x 3-1/2") are permitted to be driven into the edge, with a minimum end distance of 2-1/2 inches and a minimum spacing of 5 inches. For LSL thicknesses less that 1-1/8 inches, 16d common nails (0.162" x 3-1/2") are not permitted to be driven into the edge.

[k] Minimum end distance may be reduced to 2 inches when the nail penetration into the edge of the LSL does not exceed 1-3/8 inches.

(l) Minimum end distance may be reduced to 4 inches when the nail penetration into the edge of the LSL does not exceed 1-3/8 inches.

(m) Minimum nail spacing is tabulated for LVL manufactured from the Sutherlin plant (Mill number 1089). The minimum nail spacing may be reduced by 1 inch for LVL manufactured from the Wilmington and Golden plants (Mill numbers 1077 and 1066).

(n) Minimum nail spacing may be reduced by 1 inch for 1-3/4-inch thick (or greater) LVL manufactured from the Sutherlin plant (Mill number 1089).

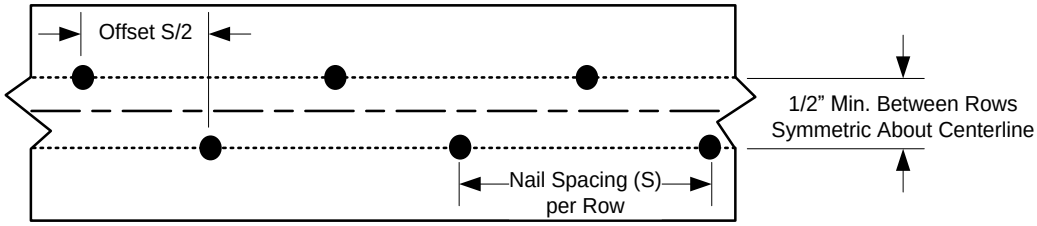

Figure 1. Spacing of multiple rows of nails.

Table 5. Strength Reduction Factors for Notches and Holes in LP SolidStart LSL and LVL Studs(a,b,c)

Material	Notches			Holes		
	Bending	Compression	Tension	Bending	Compression	Tension
LP LSL	0.95	0.90	0.75	1.00	1.00	1.00
LP LVL	0.80	0.90	0.60	0.95	0.95	0.95

(a) Design of LP LSL and LP LVL 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.

(b) The reference design stresses for bending, compression and tension from Table 1 must be multiplied by the strength reduction factors in the above table.

(c) See Section 4.3.1 for notching and boring of holes in LP LSL and LP LVL studs used in prescriptive wall framing.

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APA – THE ENGINEERED WOOD ASSOCIATION
HEADQUARTERS
7011 So. 19th St. ▪ Tacoma, Washington 98466
Phone: (253) 565-6600 ▪ Fax: (253) 565-7265 ▪ Internet Address: www.apawood.org

PRODUCT SUPPORT HELP DESK

(253) 620-7400 ▪ *E-mail Address*: help@apawood.org

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