

ICC-ES Evaluation Report

ESR-1387

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A Subsidiary of the International Code Council®

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 17 13—Laminated Veneer Lumber

Section: 06 17 23—Parallel Strand Lumber

Section: 06 17 25—Laminated Strand Lumber

REPORT HOLDER:

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EVALUATION SUBJECT:

STRUCTURAL COMPOSITE LUMBER: TIMBERSTRAND® LAMINATED STRAND LUMBER (LSL); PARALLAM® PARALLEL STRAND LUMBER (PSL); MICROLLAM® LAMINATED VENEER LUMBER (LVL); TIMBERSTRAND® LSL RIM BOARD; TJ® RIM BOARD; AND WEYERHAEUSER RIM BOARD

1.0 EVALUATION SCOPE

Compliance with the following codes:

■ 2015, 2012 and 2009 *International Building Code*® (IBC)

■ 2015, 2012 and 2009 *International Residential Code*® (IRC)

* ■ ~~2013 Abu Dhabi International Building Code (ADIBC)†~~

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Properties evaluated:

- Structural
- Fire resistance

2.0 USES

The structural composite lumber products described in this evaluation report are used as alternatives to sawn lumber for wall, floor and roof structural members. These structural applications include use as beams, headers, joists, rafters, columns, wall studs, and rim boards. The products are also used as components of built-up structural members, such as flanges for I-joists and chords for trusses, as detailed in a current ICC-ES evaluation report. TJ® Rim Board and Weyerhaeuser Rim Board are used for rim board applications only.

3.0 DESCRIPTION

3.1 General:

The structural composite lumber products described in this report comply with ASTM D5456 (PS 2, AC124 and ASTM D7672, where applicable), and are described in Sections 3.2, 3.3, 3.4 and 3.5.

3.2 Microllam LVL:

Microllam laminated veneer lumber (LVL) is manufactured from wood veneers laminated together using an exterior-type structural adhesive. All veneers are oriented with the wood grain parallel to the length of the member. The wood species, properties, adhesives, manufacturing parameters and finished product tolerances are as specified in the approved quality documentation and manufacturing standard. Microllam LVL is available in various grades and thicknesses as indicated in Table 1, with depths ranging from 2.50 inches (63.5 mm) to 48 inches (1219 mm), and lengths up to 80 feet (24 380 mm).

3.3 Parallam PSL:

Parallam parallel strand lumber (PSL) is manufactured from wood strands that are oriented parallel to the length of the member and bonded together using an exterior-type structural adhesive. The wood species, properties, adhesives, manufacturing parameters and finished product tolerances are as specified in the approved quality documentation and manufacturing standard. Parallam PSL is available in various grades as indicated in Table 1, with rectangular cross sections having a maximum width of 11 inches (279 mm), a maximum depth of 19 inches (483 mm), and lengths up to 66 feet (20 120 mm). Cross sections with depths up to 54 inches (1372 mm) are available through secondary lamination. See Footnote 14 to Table 1.

3.4 TimberStrand LSL, TimberStrand LSL Rim Boards and RedBuilt LSL Rim Boards:

TimberStrand laminated strand lumber (LSL), TimberStrand LSL Rim Boards and RedBuilt LSL Rim

Boards are manufactured from wood strands that are oriented in a direction parallel to the length of the member and bonded together using an exterior-type structural adhesive. The wood species, properties, adhesives, manufacturing parameters and finished product tolerances are as specified in the approved quality documentation and manufacturing standard. TimberStrand LSL is available in various grades as indicated in Table 1, with lengths up to 64 feet (19 500 mm), thicknesses of 1.25 to 5.50 inches (31.8 mm to 140 mm), and depths up to 48 inches (1219 mm). TimberStrand LSL Rim Board and RedBuilt LSL Rim Board are available in a 1.3E grade, with lengths up to 48 feet (14 630 mm), thicknesses of 1.25 to 1.50 inches (31.8 mm to 38.1 mm), and depths up to 24 inches (610 mm), as indicated in Table 4. TimberStrand LSL having a grade of 1.6E or lower may contain finger joints. TimberStrand LSL may be treated with zinc borate (ZB), as specified in the approved quality documentation and manufacturing standard.

3.5 TJ® Rim Board and Weyerhaeuser Rim Board:

TJ® Rim Board and Weyerhaeuser Rim Board consist of either laminated strand lumber (LSL) (described in Section 3.4) or oriented strand board (OSB). The OSB consists of wood strands that are oriented at varying angles with respect to the length of the member, and bonded together using an exterior-type structural adhesive. The wood species, properties, adhesives, manufacturing parameters and finished product tolerances are as specified in the approved quality documentation and manufacturing standard. TJ® Rim Board and Weyerhaeuser Rim Board are 1.125 inches (28.6 mm) thick, and are available in depths ranging from 9.50 to 16 inches (241 to 406 mm). They are available in lengths ranging from 8 to 24 feet (2440 to 7315 mm), as indicated in Table 4.

4.0 DESIGN AND INSTALLATION

4.1 General:

The design and installation of Weyerhaeuser structural composite lumber products must comply with this report and the report holder's published installation instructions. Design of the structural composite lumber products described in this report is governed by the applicable code and the ANSI/AWC *National Design Specification® for Wood Construction* (NDS). In the event of a conflict between the report holder's published installation instructions and this report, the more restrictive governs. Reference design values for Microllam® LVL, Parallam® PSL, TimberStrand® LSL, TJ® Rim Board, and Weyerhaeuser Rim Board are given in Table 1.

4.2 Connections:

The design of mechanical connections for Microllam® LVL, Parallam® PSL, TimberStrand® LSL, TJ® Rim Board, and Weyerhaeuser Rim Board must be in accordance with the NDS. Equivalent specific gravities for nailed, screwed, bolted and lag screwed connections are given in Table 2. Minimum nail spacing, and end and edge distance requirements, are given in Table 3. Nailing requirements for the attachment of wall sheathing are given in Section 4.5.

Exception: Lag screw connections between rim board products and deck ledgers have allowable lateral loads as specified in Table 4, under the following conditions:

1. Lag screws must have a minimum diameter of 0.50 inch (12.7 mm), and sufficient length to penetrate through the rim board, not including tips.
2. Deck ledgers must consist of minimum nominally 2-by-6 lumber having a minimum assigned specific gravity of 0.42.

3. Sheathing between the rim board and 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.
4. One flat washer must be used between the deck ledger and the lag screw head.
5. Adjustment factors in accordance with the NDS must be applied as applicable.

For nail and bolt connections other than those described in this report, specific approval by the authority having jurisdiction is required.

4.3 Fire Resistance and Fireblocking:

4.3.1 TimberStand® LSL, Microllam® LVL and Parallam® PSL: For applications under the 2015, 2012 and 2009 IBC, the fire resistance of exposed Microllam LVL and Parallam PSL members may be calculated in accordance with Chapter 16 of the ANSI/AWC/AF&PA NDS.

4.3.2 TimberStrand® LSL: TimberStrand LSL of equivalent sizes to that of sawn lumber may be substituted for sawn lumber in fire-resistance-rated floor and roof assemblies, as specified in Table 721.1(3) of the 2015 and 2012 IBC and Table 720.1(3) of the 2009 IBC. TimberStrand LSL wall studs without finger joints may be used in the one-hour fire-resistance-rated wall assemblies specified in Table 721.1(2) of the 2015 and 2012 IBC and Table 720.1(2) of the 2009 IBC as direct replacements for non-fire-retardant-treated

2-by-6 sawn lumber studs, subject to the following conditions:

1. The studs must have minimum cross-sectional dimensions of 1.5 inches (38 mm) by 5.5 inches (140 mm).
2. Tape and joint compound must be applied to all fastener heads and gypsum wallboard joints on exposed surfaces.
3. The design axial compressive stress within the TimberStrand LSL studs must not exceed the least of the following:
 - a. 435 psi (2998 kPa).
 - b. $0.30F_c'$, where F_c' is the compression design value parallel-to-grain for the LSL, adjusted by all applicable adjustment factors in accordance with the NDS, including the column stability factor, C_P .
 - c. $0.30F_c'$, where F_c' is calculated in accordance with the NDS, assuming a slenderness ratio L_e/d of 21.

TimberStrand LSL having a minimum net thickness of 1.25 inches (31.7 mm) may be used in fireblocking applications, as an alternative to the nominal 2-inch-thick (51 mm) sawn lumber noted in Section 718.2.1(1) of the 2015 and 2012 IBC, Section 717.2.1(1) of the 2009 IBC and Section R302.11.1(1) of the IRC.

4.3.3 TJ® Rim Board and Weyerhaeuser Rim Board: TJ® Rim Board and Weyerhaeuser Rim Board may be used in lieu of sawn lumber for fire blocking.

4.3.4 TimberStrand® LSL with Flak Jacket® FRT Protection: TimberStrand® LSL with Flak Jacket® FRT protection applied to both wide faces and used in continuously supported rim board applications is an alternative to the fire-retardant-treated wood in Section 2303.2 of the IBC.

Missing and damaged Flak Jacket® FRT protection are permitted to an area less than and equal to 3.5-inch- wide (88.9 mm) by the height up to 24 inches (305 mm) of rim board, occurring once in 5 feet (1524 mm) of length. Exposed end grain does not require Flak Jacket® FRT protection.

Holes and notches in the rim board shall comply with applicable codes and manufacturer's published literature. Penetrations into and through fire-resistance-rated wall assemblies must also be detailed and constructed in accordance with Section 714 of the IBC.

4.4 Rim Board:

Each rim board product described in this evaluation report is used as a structural element located at the joist elevation in an end bearing wall or parallel to the joist framing that is the full depth of the joist space and manufactured in minimum continuous 8-foot-long (2.44 m) segments for the length of the wall. Rim board products in this report are not required to be continuously supported provided they are designed as flexural members using the reference design values shown in Table 4. The rim boards may be used for any combination of the following:

1. To transfer, from above to below, all vertical loads at the rim board location. Allowable vertical loads are given in Table 4.
2. To provide diaphragm attachment (sheathing to top edge of rim board).
3. To transfer in-plane lateral loads from the diaphragm to the wall plate below. Allowable lateral loads are given in Table 4.
4. To provide lateral support to the joist or rafter (resistance against rotation) through attachment to the joist or rafter.
5. To provide closure for ends of joists or rafters.
6. To provide an attachment base for siding or an exterior deck ledger.

4.5 Wall Studs:

TimberStrand LSL may be used as wall stud material in accordance with the prescriptive requirements of the applicable code. Cutting, notching and boring of nominally 2-by-4 and 2-by-6 TimberStrand LSL studs is permitted in accordance with Sections 2308.5.9 and 2308.5.10 of the 2015 IBC, 2308.9.10 and 2308.9.11 of the IBC, and Section R602.6 of the IRC.

The allowable shear values for nailed wood structural panel shear walls utilizing TimberStrand LSL framing must be determined using Table 4.3A of the ANSI/AWC Special Design Provisions for Wind and Seismic (SDPWS) or Table 2306.3 of the 2009 IBC, subject to the following:

1. TimberStrand LSL having a grade of 1.55E or lower is considered to be equivalent to sawn lumber studs with a specific gravity of 0.42, with the exception that the minimum boundary nail spacing permitted for grades lower than 1.5E must be 6 inches (152 mm) on center. TimberStrand LSL of grades 1.5E or higher, may be used with boundary nail spacings from 2 inches (51 mm) to 6 inches (152 mm) on center.
2. TimberStrand LSL having a grade of 1.6E or higher is considered to be equivalent to sawn lumber studs with a specific gravity of 0.50.

5.0 CONDITIONS OF USE

The structural composite lumber [TimberStrand® Laminated Strand Lumber (LSL), Parallam® Parallel Strand

Lumber (PSL), and Microllam® Laminated Veneer Lumber (LVL)]; TimberStrand® LSL Rim Board; TJ® Rim Board; and Weyerhaeuser Rim Board products described in this report comply with, or are suitable alternatives to what is specified, in those codes listed in Section 1.0, subject to the following conditions:

- 5.1 Installation, fabrication, identification, and connection details must be in accordance with this report, the manufacturer's published installation instructions and the applicable code.
- 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 The products described in this report must be limited to covered end-use installations with dry conditions of use in which the in-service equilibrium moisture content is less than 16 percent.
- 5.4 Length and depth dimensions of TimberStrand LSL, Parallam PSL and Microllam LVL may be cut to size for required application. Depth must not be cut to less than 3.50 inches (89 mm). Thickness dimension of Parallam PSL and TimberStrand LSL may be cut to a minimum of 1.75 inches (45 mm). Microllam LVL must not be cut in thickness. For all material used in structural applications, the product identification described in Section 7.0 must be maintained on all material, or the material must be re-stamped with the appropriate identification only under the approval and direction of PFS Corporation, Intertek Testing Services, or APA—The Engineered Wood Association. Additionally, TimberStrand LSL, Parallam PSL, Microllam LVL, TJ Rim Board, and Weyerhaeuser Rim Board may be notched, drilled, or tapered end cut provided design is by a design professional.
- 5.5 TimberStrand LSL that has been treated with zinc borate (ZB) may be used within the building envelope, such as for sill plates supported by masonry or concrete footings, foundations or slabs (including where preservative-treated lumber is required within the building envelope) in accordance with the American Wood Protection Association (AWPA) "Use Category UC2." When used under these conditions, the corrosion rate of carbon steel and/or galvanized steel in contact with ZB-treated TimberStrand LSL is not increased by the ZB treatment. TimberStrand LSL treated with ZB must not be used in exposed exterior or ground-contact applications.
- 5.6 TimberStrand LSL, TimberStrand LSL Rim Board and RedBuilt LSL Rim Board are produced at the Weyerhaeuser manufacturing plant located in Kenora, Ontario, Canada; with quality-control inspections by ICC-ES and PFS Corporation (AA-652). For TimberStrand® LSL with Flak Jacket® FRT protection, the Flak Jacket® FRT protection is applied in accordance with approved manufacturing standard and quality-control program with inspections by ICC-ES and PFS Corporation (AA-652).
- 5.7 Parallam PSL is produced at the Weyerhaeuser manufacturing plants located in Annacis Island, British Columbia, Canada; and Buckhannon, West Virginia; with quality-control inspections by ICC-ES and PFS Corporation (AA-652).

5.8 Parallam PSL is secondary laminated for Weyerhaeuser at Structurlam Products, Ltd., Okanagan Falls, British Columbia, Canada, with quality-control inspections by ICC-ES and PFS Corporation (AA-652) or Intertek Testing Services (AA-691).

5.9 Microllam LVL is produced at the Weyerhaeuser manufacturing plants located in Buckhannon, West Virginia; Eugene, Oregon; Natchitoches, Louisiana; and Castleberry, Alabama; and at the RedBuilt™ LLC plant in Stayton, Oregon; with quality-control inspections by ICC-ES and PFS Corporation (AA-652). Additionally, 1.9E, 2.0E and 2.2E Microllam LVL are manufactured at the Pacific Woodtech manufacturing plant located in Burlington, Washington, with quality-control inspections by ICC-ES and APA—The Engineered Wood Association (AA-649).

5.10 TJ® Rim Board is produced at the Weyerhaeuser manufacturing plant located in Elkin, North Carolina; with inspections by ICC-ES and APA—The Engineered Wood Association (AA-649) or PFS Corporation (AA-652); and at the Weyerhaeuser manufacturing plant located in Kenora, Ontario, Canada; with quality-control inspections by ICC-ES and PFS Corporation (AA-652).

5.11 Weyerhaeuser Rim Board is produced at the Weyerhaeuser manufacturing plant located in Elkin, North Carolina; with inspections by ICC-ES and APA—The Engineered Wood Association (AA-649) or PFS Corporation (AA-652).

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Structural Wood-based Products (AC47), dated June 2016 (editorially revised August 2016) .

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Rim Board Products (AC124), dated October 2016.

6.3 Data in accordance with the ICC-ES Acceptance Criteria for Zinc Borate (ZB) Preservative Treatment of Structural Composite Wood by Non-pressure

Processes (AC203), dated February 2010 (editorially revised July 2016).

6.4 Data in accordance with the ICC-ES Acceptance Criteria for Wood-Based Studs (AC202), dated June 2009 (editorially revised July 2016).

6.5 Reports of fire tests conducted in accordance with ASTM E119.

7.0 IDENTIFICATION

7.1 General:

The structural composite lumber and rim board products described in this report are identified with a stamp bearing the plant number, the product designation or type, the production date, the grade, the report holder's or listee's name and/or logo , the name or logo of the inspection agency (PFS Corporation, Intertek Testing Services, or APA EWS), as applicable, and the evaluation report number (ESR-1387).

7.2 Additional Identification for Specific Products:

In addition to the information noted in Section 7.1, specific products are further identified with the following information:

1. The stamps on Microllam® LVL and Parallam® PSL also identify the species or species group, as listed in Table 1.
2. TimberStrand LSL treated with zinc borate (ZB), as described in Section 3.4 of this report, is identified with the designations "ZB" and "AWPA UC2."
3. The stamps on rim board products also indicate the rim board thickness.
4. TimberStrand® LSL with Flak Jacket® FRT protection is identified by a Flak Jacket® protection stamp placed on the wide face.

TABLE 1—REFERENCE DESIGN VALUES FOR MICROLLAM® LVL, PARALLAM® PSL AND TIMBERSTRAND® LSL^{1,2,5}

GRADE ⁽³⁾	BILLET MATERIAL THICKNESS (in.)	Modulus of Elasticity ⁽⁵⁾		JOIST / BEAM ORIENTATION ⁽⁴⁾			FACE / PLANK ORIENTATION ⁽⁴⁾			AXIAL	
				Bending F _b ⁽⁷⁾ (psi)	Shear F _v (psi)	Compression Perp-to-Grain F _{c⊥} (psi)	Bending F _b ⁽⁷⁾ (psi)	Shear F _v (psi)	Compression Perp-to-Grain ⁽¹⁶⁾ , F _{c⊥} (psi)	Tension F _t ⁽⁹⁾ (psi)	Compression F _c (psi)
		E x10 ⁶ (psi)	E _{min} x10 ⁶ ⁽⁶⁾ (psi)								
Microllam® LVL											
1.6E WS	0.75 to 3.50	1.6	0.813	2140	285 ⁽¹¹⁾	750	2530	190	480	1240	2100
1.8E WS		1.8	0.915	2445	285 ⁽¹¹⁾	750	2890	190	480	1450	2375
1.9E WS		1.9	0.966	2600	285 ⁽¹¹⁾	750	3075	190 ⁽¹³⁾	480	1555	2510
2.0E-2750F _b WS		2.0	1.017	2750	285 ⁽¹¹⁾	750	3255	190	480	1660	2635
2.0E-2900F _b WS ⁽¹⁰⁾		2.0	1.017	2900	285 ⁽¹¹⁾	750	3430	190	480	1660	2635
2.2E WS		2.2	1.118	3060	285 ⁽¹¹⁾	750	3615 ⁽¹²⁾	190 ⁽¹³⁾	480	1865	2870
2.4E WS		2.4	1.220	3365	285 ⁽¹¹⁾	750	3980	190	480	2075	3080
2.6E WS		2.6	1.312	3675	285 ⁽¹¹⁾	750	4345	190	480	2285	3270
1.8E SP/EUC		1.8	0.915	2445	285 ⁽¹¹⁾	880	2890	190	525	1575	2375
1.9E SP/EUC		1.9	0.966	2600	285 ⁽¹¹⁾	880	3075	190	525	1690	2510
2.0E SP/EUC		2.0	1.017	2750	285 ⁽¹¹⁾	880	3255	190	525	1805	2635
2.0E-2900F _b SP/EUC		2.0	1.017	2900	285 ⁽¹¹⁾	880	3255	190	525	1660	2635
2.2E SP/EUC		2.2	1.118	3060	285 ⁽¹¹⁾	880	3615	190	525	2030	2870
2.4E SP/EUC		2.4	1.220	3365	285 ⁽¹¹⁾	880	3980	190	525	2260	3080
2.6E SP/EUC		2.6	1.312	3675	285 ⁽¹¹⁾	880	4345	190	525	2485	3270
1.6E YP/RM		1.6	0.813	2140	285 ⁽¹¹⁾	800	2530	190	670	1350	2100
1.8E YP/RM		1.8	0.915	2445	285 ⁽¹¹⁾	800	2890	190	670	1575	2375
1.9E YP/RM		1.9	0.966	2600	285 ⁽¹¹⁾	800	3075	190	670	1690	2510
2.0E YP/RM		2.0	1.017	2750	285 ⁽¹¹⁾	800	3255	190	670	1805	2635
2.0E-2900F _b YP/RM		2.0	1.017	2900	285 ⁽¹¹⁾	800	3255	190	670	1805	2635
2.2E YP/RM		2.2	1.118	3060	285 ⁽¹¹⁾	800	3615	190	670	2030	2870
2.0E-3100F _b YP/RM		2.0	1.017	3100	285 ⁽¹¹⁾	800	3255	190	670	1805	2635
2.0E-2600F _b DF/SP/YP		2.0	1.017	2600	285 ⁽¹¹⁾	750	3075	190 ⁽¹³⁾	480	1555	2510
2.0E-2925F _b SP	0.75 to 1.75	2.0	1.017	2925	285 ⁽¹¹⁾	880	3455	190	525	1805	3030
Parallam® PSL ⁽¹⁴⁾											
1.8E DF	Up to 11.0	1.8	0.915	2500 ⁽⁸⁾	230	545	2400	190	545	1755	2500
1.9E DF		1.9	0.966	2700 ⁽⁸⁾	260	580	2525	200	585	1890	2700 ⁽¹⁵⁾
2.0E DF		2.0	1.017	2900 ⁽⁸⁾	290	625	2650	210	635	2025	2900 ⁽¹⁵⁾
2.1E DF		2.1	1.067	2900 ⁽⁸⁾	290	625	2650	210	635	2025	2900 ⁽¹⁵⁾
2.2E DF		2.2	1.118	2900 ⁽⁸⁾	290	625	2650	210	635	2025	2900 ⁽¹⁵⁾
1.8E SP		1.8	0.915	2500 ⁽⁸⁾	230	600	2400	190	595	1755	2500
1.9E SP		1.9	0.966	2700 ⁽⁸⁾	260	675	2600	200	665	1890	2700 ⁽¹⁵⁾
2.0E SP		2.0	1.017	2900 ⁽⁸⁾	290	750	2800	210	735	2025	2900 ⁽¹⁵⁾
2.1E SP		2.1	1.067	3100 ⁽⁸⁾	320	825	3000	220	805	2160	3100 ⁽¹⁵⁾
1.8E YP – YP/RM		1.8	0.915	2500 ⁽⁸⁾	230	600	2400	190	735	1755	2500
1.9E YP – YP/RM		1.9	0.966	2700 ⁽⁸⁾	260	675	2600	200	840	1890	2700 ⁽¹⁵⁾
2.0E YP – YP/RM		2.0	1.017	2900 ⁽⁸⁾	290	750	2800	210	945	2025	2900 ⁽¹⁵⁾
2.1E YP – YP/RM		2.1	1.067	3100 ⁽⁸⁾	320	825	3000	220	1050	2160	3100 ⁽¹⁵⁾
TimberStrand® LSL											
1.3E	1.25 to 5.50	1.3	0.661	1700	425	710	1900	150	635 ⁽¹⁷⁾	1075	1835
1.35E		1.35	0.686	1840	445	750	2055	150	665	1180	1905
1.4E		1.4	0.712	1975	465	785	2215	150	690	1290	1970
1.45E		1.45	0.737	2115	485	825	2370	150	720	1395	2035
1.5E		1.5	0.762	2250	505	860	2525	150	750	1500	2105
1.55E		1.55	0.788	2325	525	900	2615	150	775	1600	2170
1.6E		1.6	0.813	2425	545	935	2700	150	900	1700	2235
1.65E		1.65	0.839	2500	565	975	2800	150	835	1765	2305
1.7E		1.7	0.864	2600	585	1010	2900	150	860	1825 ⁽¹⁸⁾	2370
1.75E		1.75	0.889	2720	605	1050	3040	150	890	1905	2435
1.8E		1.8	0.915	2840	625	1090	3175	150	920	1990	2505
1.85E		1.85	0.940	2955	625	1090	3315	150	945	2070	2505
1.9E		1.9	0.966	3075	625	1090	3450	150	975	2150	2505
1.95E		1.95	0.991	3180	625	1090	3570	150	1005	2240	2505
2.0E		2.0	1.017	3290	625	1090	3690	150	1030	2325	2505
2.05E		2.05	1.042	3395	625	1090	3805	150	1060	2410	2505
2.1E		2.1	1.067	3500	625	1090	3925	150	1090	2500	2505
TJ® Rim Board and Weyerhaeuser Rim Board											
0.6E OSB	1.125	0.6	0.305	700 ⁽¹⁹⁾	395	660	-	-	--	-	-
1.0E TimberStrand® LSL		1.0	0.508	1300 ⁽¹⁹⁾	395	660	-	-	--	-	-

For **SI**: 1 psi = 0.00689 MPa, 1 inch = 25.4 mm.¹Reference design values are based on dry conditions of use where the in-service moisture content is less than 16 percent (See Section 5.3).²Reference design values must be adjusted, as applicable, in accordance with Section 8.3 of the NDS.³Grade designations for Microllam LVL and Parallam PSL include species codes as follows: DF = Douglas fir-larch; LP = lodgepole pine; SP = southern pine; YP = yellow poplar; RM = red maple; EUC = Eucalyptus. DF and LP are permitted to be combined as Western Species (WS). SP, YP, SP/EUC and YP/RM are permitted to be combined as Eastern Species (ES). When using the species group designations WS or ES, the allowable stress is the lower value for the species in the group.⁴See Figure 1 for an illustration of member orientations with respect to load direction.⁵Applies for both joist and plank orientation. Calculated deflection of flexural members must account for combined bending and shear deflection. For example, the deflection of a uniformly loaded simple span beam is calculated as follows:

$$\Delta = \frac{270WL^4}{Ebd^3} + \frac{28.8W^2L^2}{Ebd}$$

Where:
 Δ = Deflection, inches
 L = Span, feet
 d = Beam depth, inches
 W = Uniform load, plf
 b = Beam width, inches
 E = Modulus of Elasticity, psi

⁶ E_{min} is the reference modulus of elasticity for beam and column stability calculations, per the NDS.⁷Reference bending design values, F_b , for the applicable orientation must be adjusted by the appropriate factors in the following table:

(Footnotes to Table 1 continued on following page)

MATERIAL	DEPTH ADJUSTMENT BY ORIENTATION		EQUATION (d = member depth in inches)	Member Depth (in.)													
				≤ 3.5	5.5	7.25	9.25	9.50	12.0	14.0	16.0	18.0	20.0	24.0	48.0	54.0	
	Joist	Plank		C _V Adjustment Factor													
Microllam® LVL	Yes	No	$C_V = (12/d)^{0.136} \leq 1.18$	1.18	1.11	1.07	1.04	1.03	1.00	0.98	0.96	0.95	0.93	0.91	0.83	--	
Parallam® PSL	Yes	Yes	$C_V = (12/d)^{0.111} \leq 1.15$	1.15	1.09	1.06	1.03	1.03	1.00	0.98	0.97	0.96	0.94	0.93	0.86	0.85	
TimberStrand® LSL	Yes	No	$C_V = (12/d)^{0.092} \leq 1.12$	1.12	1.07	1.05	1.02	1.02	1.00	0.99	0.97	0.96	0.95	0.94	0.88	--	

⁸For Parallam® PSL, the tabulated reference edgewise design bending, F_b, values must be multiplied by 0.93, when the cross-sectional width is less than 2.69 inches.

⁹Tabulated reference tension design values, F_t, have been reduced to reflect the volume effects of length, width and thickness for a range of common application conditions. The F_t values for Microllam LVL and TimberStrand LSL may be higher when approved by Weyerhaeuser for use as a component of engineered products, which are manufactured under a recognized quality control program.

¹⁰The 2.0E-2900F_b WS grade Microllam LVL is used in header or beam applications only.

¹¹For depths greater than 24 inches, the reference design value, F_v, for joist/beam orientation for Microllam LVL is 260 psi.

¹²The face/plank F_b is limited to 3100 psi for 2.2E Microllam LVL stamped with plant number 1047.

¹³Microllam LVL stamped with plant number of 1047 has a face/plank F_v of 150 psi, and is available in either a 1.75-inch or 1.375-inch thickness.

¹⁴The allowable design stresses given in this table for Parallam PSL are also applicable to Parallam PSL that has been secondary laminated in accordance with the approved Weyerhaeuser quality control manuals for secondary lamination.

¹⁵For column applications, F_c = 500 psi. Alternatively, column capacity can be determined using the provisions of Chapter 15 of the NDS in conjunction with the published F_c value above and a minimum eccentricity, e₂, applied parallel to the narrow face of the column. See Figure 2 for an illustration.

$$e_2 = t/6 + 5L^2/4608$$

Where:

e₂ = Eccentricity applied parallel to the narrow face of the column, inches

t = Member thickness of the narrow face of the column, inches

L = Unbraced column length about the weak axis, feet.

¹⁶The bearing area factor, C_b, shall be in accordance with the NDS Section 3.10.4 for plank orientation compression perpendicular-to-grain reference design values.

¹⁷The Compression Perp-to-Grain, F_{c⊥} value for TimberStrand® LSL with thicknesses less than 1.75 inches is 670 psi.

¹⁸When 1.7E grade TimberStrand® LSL is used as truss chords and webs of engineered wood trusses, the reference axial tension design value is 2050 psi. This value includes an adjustment for length effect. The TimberStrand LSL material must be marked as "Truss Chord Grade", and the engineered wood trusses must be manufactured under the approved quality control program.

¹⁹The design bending strengths for OSB and TimberStrand LSL based TJ Rim Board and Weyerhaeuser Rim Board are applicable to depths of up to 16 inch (406 mm) and spans up to 8 feet (2438 mm).

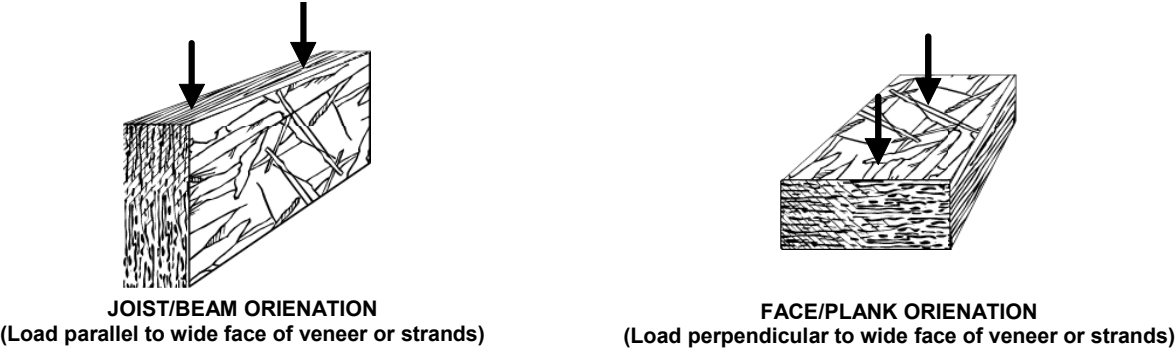


FIGURE 1—MEMBER ORIENTATION WITH RESPECT TO LOAD DIRECTION

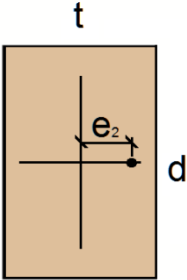


FIGURE 2—ILLUSTRATION OF ECCENTRICITY, e₂, USED FOR PARALLAM® PSL COLUMN DESIGN

TABLE 2—EQUIVALENT SPECIFIC GRAVITIES FOR FASTENER DESIGN^{1,2,3}

PRODUCT	EQUIVALENT SPECIFIC GRAVITY							
	Nails and Screws				Bolts		Lag Screws	
	Withdrawal		Dowel Bearing		Dowel Bearing (Installed in Face) ⁴		Dowel Bearing (Installed in Face) ⁴	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Load Applied Parallel to Grain	Load Applied Perpendicular to Grain	Load Applied Parallel to Grain	Load Applied Perpendicular to Grain
Microllam [®] LVL	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parallam [®] PSL	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
TimberStrand [®] LSL	0.42	0.50	0.50	0.50	0.50	0.58	0.50	0.55 ⁽⁵⁾
TJ [®] Rim Board and Weyerhaeuser Rim Board	—	0.38	—	0.50	0.38	0.50	—	(5)

¹Connection design values must be calculated in accordance with NDS Chapters 10 and 11, using the tabulated equivalent specific gravities given above, and must be adjusted by the applicable factors specified in the NDS.

²See Figure 3 for an illustration depicting face and edge nailing.

³Minimum nail spacing, and end and edge distances must be as specified in Table 3. Minimum spacing, end and edge distances for bolts and lag screws must be as specified in the NDS.

⁴Equivalent specific gravity values for bolts and lag screws apply only to bolts and lag screws installed into the face of the member.

⁵The allowable lateral load for lag screws used in deck ledger connections between the rim board products listed in this report and deck ledgers complying with the exceptions in Section 4.2 are given in Table 4.

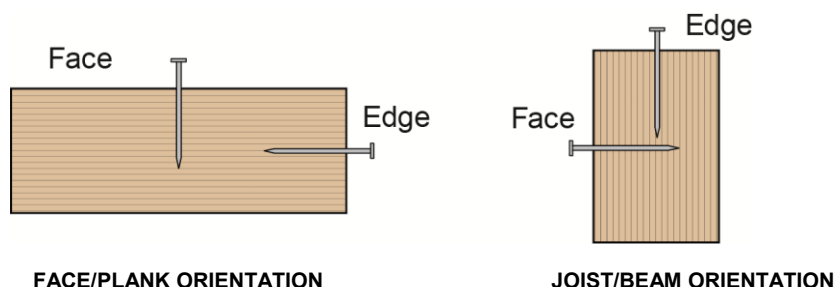


FIGURE 3—FACE AND EDGE NAILING EXAMPLES

TABLE 3—MINIMUM NAIL AND STAPLE SPACING ALONG THE EDGE OF THE MEMBER^{1,2,3}

NAIL TYPE AND SIZE		MINIMUM NAIL AND STAPLE SPACING (in.)						
Penny Weight	Diameter x Length (in.)	Microllam LVL ⁽⁴⁾		Parallam PSL ⁽⁴⁾	TJ Rim Board and Weyerhaeuser Rim Board	TimberStrand LSL ⁽⁴⁾ and TimberStrand LSL Rim Board		
		Minimum Member Thickness (in.)						
		0.75	1.5	1.75	1.125	1.25	1.5	1.75-3.5
8d Box	0.113 x 2.5	3	3	3	6	4	3	3
8d Common	0.131 x 2.5	4	4	4	6	4	3	3
10d Box	0.128 x 3.0	4	4	4	6	4	3	3
10d Common	0.148 x 3.0	5	5	4	6	4	3	3
12d Box	0.128 x 3.25	5	5	4	6 ⁽⁶⁾	4	3	3
12d Common	0.148 x 3.25	5	5	4	6 ⁽⁶⁾	4	3	3
16d Box	0.135 x 3.5	—	5	4	16 ⁽⁷⁾	4	3	3
16d Common	0.162 x 3.5	—	8 ⁽⁷⁾	6	16 ⁽⁷⁾	6 ⁽⁶⁾	6 ⁽⁶⁾	6 ⁽⁵⁾
16d Sinker	0.148 x 3.25	—	5	4	16 ⁽⁷⁾	4	3	3
No. 14 gage staple	—	4	4	—	—	—	—	—

For SI: 1 inch = 25.4 mm

¹Tabulated minimum spacing values are for nails and staples in a row driven into the edge of the member. The closest permitted on-center spacing for nails driven into the face is the same as permitted by the code for sawn lumber, and must be sufficient to prevent splitting. See Figure 3 for an illustration depicting face and edge nailing.

²To minimize splitting, member edge distance and spacing between rows shall be per the NDS Commentary or 0.375 inch, whichever is greater. Where multiple rows are used, fasteners in adjacent rows must be staggered and the rows must be equally spaced from the centerline of the narrow face axis.

³Maximum permissible number of rows is 2 for 1.25 and 1.5 inch thicknesses, 3 for 1.75 inch thickness and 6 for thicknesses greater than or equal to 3.5 inches.

⁴Other nail spacings for specific applications, such as prefabricated steel components or hangers, may be used as detailed for Microllam[®] LVL, Parallam[®] PSL and TimberStrand[®] LSL in a current ICC-ES evaluation report.

⁵When nailing through the wall sill plate and floor sheathing, such that the maximum nailing penetration into the rim board is 1.25 inches, the minimum allowable on-center spacing may be decreased to 3.5 inches.

⁶When nailing through the wall sill plate and floor sheathing, such that the maximum nail penetration into the rim board is 1.25 inches, the minimum allowable on-center spacing may be decreased to 4 inches.

⁷When nailing through the wall sill plate and floor sheathing, such that the maximum nail penetration into the rim board is 1.25 inches, the minimum allowable on-center spacing may be decreased to 5 inches.

**TABLE 4—ALLOWABLE DESIGN LOADS FOR TIMBERSTRAND® LSL,
TJ® RIM BOARD, AND WEYERHAEUSER RIM BOARD PRODUCTS**

Rim Board Product:		TimberStrand® LSL RedBuilt LSL								TJ® Rim Board and Weyerhaeuser Rim Board						
Rim Grade:		≥1.3E			1.5E			≥1.55E			0.60E/1.0E					
Rim Thickness (in.):		≥1.25	1.5	≥1.75	≥1.25	1.5	≥1.75	≥1.25	1.5	≥1.75	1.125					
Uniform Vertical Load (lbs/ft) ⁽¹⁾																
Depth (in.)	≤9.5	5400 ⁽²⁾	6480 ⁽²⁾	7560 ⁽²⁾	5400 ⁽²⁾	6480 ⁽²⁾	7560 ⁽²⁾	5400 ⁽²⁾	6480 ⁽²⁾	7560 ⁽²⁾	4860 ⁽²⁾					
	11.875										4570					
	14	5000	6380		4960			5120			4000					
	16										(3)					
	18	4340	5740		4210			4340								
	20	3700	5070		3580			3690				5980				
	22	3160	4440	7130	5800			5980								
	24	2710	4440	6470	3070	5060	7430	3160	5210							
Lateral Load (lbs/ft) ^(4,5,6)																
Depth (in.)	9.5-24 ⁽³⁾	(7)									220 ^(3,8)					
Concentrated Vertical Load (lbs) ⁽⁹⁾																
Depth (in.)	9.5-24 ⁽³⁾	3760	4520	4520	4520	4520	4520	4520	4520	7470	3400 ⁽³⁾					
Deck Ledger Capacity (lbs/bolt) ⁽¹⁰⁾																
Fastener Type	0.50 in. Lag	610	675						725	480						
	0.50 in. Bolt	725									695					
	0.50 in. Bolt w/ air space	615 ⁽¹¹⁾														
Axial Stiffness ⁽¹²⁾																
Axial Stiffness		147000			166000			170000			145000					

For SI: 1 inch = 25.4 mm; 1 plf = 14.59 N/m.

¹Tabulated uniform vertical load values shall not be increased for duration of load.

²The capacity for this product is limited by a maximum of 360 psi per ASTM D7672.

³TJ® Rim Board and Weyerhaeuser Rim Board are limited to a depth of 16 inch or less.

⁴The maximum lateral load transfer capacities are for seismic design applications. They may be increased by a factor of 1.4 for wind design applications.

⁵Additional hardware, blocking, overlapped sheathing, or other attachment details may be designed to transfer loads into, and out of, the product's wide face.

⁶Toe-nailed connections are not limited by the 150 lb/ft allowable lateral load capacity as noted for Seismic Design Categories D, E, and F in Section 4.1.7 of the SPDWS.

⁷Subject to the nail installation limitations of Table 3, these rim board products may be designed as permitted in the applicable code for wood structural panel diaphragms with framing consisting of Douglas-fir larch or southern pine lumber. Products with a thickness greater than or equal to 1.25 in. may be designed as 2-inch nominal framing. Products with a thickness greater than or equal to 2.5 in. may be designed as 3-inch nominal framing.

⁸The tabulated allowable in-plane lateral load for TJ Rim Board and Weyerhaeuser Rim Board are applicable to installations using the following nailing schedule:

-Sheathing to rim board: 8d Common nails (0.131 x 2.5 in.) (or equivalent) at 6 inches on center

-Rim board to sill plate: 10d pneumatic nails (0.131 x 3.0 in.) (or equivalent), toe-nailed at 6 inches on center

-I-joist to sill plate: 8d Box (0.113 x 2.5 in.) (or equivalent), one slanted nail each side of the bottom flange

-Rim board to I-joist: 10d pneumatic nails (0.131 x 3.0 in.) (or equivalent) one each into the top and bottom flanges.

⁹The allowable concentrated vertical load capacities require a minimum bearing width of 4.5 in. Tabulated concentrated vertical load values shall not be increased for duration of load.

¹⁰These deck ledger attachment details correspond with those described by Section R507.2 of the 2015 and 2012 IRC and Section R502.2.2.1 of the 2009 IRC. These 10-year load duration allowable design loads may be increased per the applicable code for shorter duration loadings and used to design alternative deck ledger connections as permitted by Section R301.1.3 of the 2015 IRC, R507.2.2 of the 2012 IRC and Section R502.2.2.2 of the 2009 IRC.

¹¹Maximum 0.50 inch (13 mm) shimmed air space.

¹²Axial stiffness is in the cross-grain orientation and is measured in accordance with ASTM D7672 for vertical rim applications.