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DIVISION: 06—WOOD AND PLASTICS
Section: 06170—Prefabricated Structural Wood

REPORT HOLDER:

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EVALUATION SUBJECT:

VERSA-LAM®, VERSA-STUD® AND VERSA-RIM® LAMINATED VENEER LUMBER

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code*© (SBC)
- 1997 *Uniform Building Code*™ (UBC)

Properties evaluated:

- Structural
- Fire resistance
- Fireblocking material

2.0 USES

VERSA-LAM and VERSA-STUD are used for structural applications such as beams, headers, joists, rafters, wall studs and rim joists. VERSA-RIM is used in rim joist applications.

3.0 DESCRIPTION

The laminated veneer lumber (LVL) described in this report is manufactured from veneers and adhesives meeting the requirements specified in the *Quality Control Manual for VERSA-LAM® Laminated Veneer Lumber* prepared by Boise Building Solutions Manufacturing, LLC.

VERSA-LAM and VERSA-RIM are LVL manufactured with the wood fibers primarily oriented parallel to the length of the member. VERSA-LAM is available in various grades as indicated in Table 1. VERSA-LAM is produced in thicknesses up to 7 inches (178 mm), with depths up to 48 inches (1219 mm) and lengths up to 66 feet (20.1 m). VERSA-LAM beams are sawn such that the veneers are vertical (joist direction) when the member is installed in its primary application.

VERSA-LAM is also distributed under the proprietary name of VERSA-LAM PLUS®, VERSA-RIM® PLUS, and VERSA-STUD®. VERSA-STUD® is manufactured to match commonly available solid-sawn lumber sizes.

VERSA-RIM is available in thicknesses up to $1^1/_4$ inches (32 mm), with depths up to 20 inches (508 mm) and lengths up to 66 feet (20.1 m).

4.0 DESIGN AND INSTALLATION

4.1 General:

The design provisions for wood construction noted in the applicable code are applicable to VERSA-LAM and VERSA-RIM unless otherwise noted in this report. Reference design values for dry conditions of use of VERSA-LAM are indicated in Table 1. The stresses in Table 1, except compression perpendicular to grain and modulus of elasticity, are permitted to be adjusted for duration of load in accordance with the applicable code. The reference design bending stresses in Table 1 are permitted to be increased 4 percent for repetitive members as defined in the applicable code, as indicated in this report, for solid-sawn lumber. Allowable vertical and lateral load transfer capacities for VERSA-LAM and VERSA-RIM used as rim board are indicated in Table 2.

4.2 Connections:

The design of connections for the LVL described in this evaluation report must be in accordance with the NDS for solid wood species with an equivalent specific gravity. The equivalent specific gravity characteristics for nail and bolt design for dry-use conditions are found in Table 4. Allowable connector spacing is indicated in Table 3.

4.3 Fire Blocking:

VERSA-LAM and VERSA-RIM may be substituted for solid-sawn lumber fireblocking provided the minimum sizes of LVL, as indicated in this report, are as specified by the applicable code for solid-sawn material.

4.4 Rim Board:

For the purposes of this evaluation report, rim boards are defined as continuously supported structural members (except as noted in the last sentence of Section 4.4 of this report), located at the joist elevation either perpendicular to, or parallel to, the joist framing, that are the full depth of the joist space and that are used for the following purposes:

1. Transfer, from above to below, of vertical loads at the rim board location. Allowable vertical loads are noted in Table 2.
2. Providing diaphragm attachment (sheathing to top edge of rim board).
3. Transferring in-plane lateral loads from the diaphragm to the wall plate below.

4. Providing lateral support to the joist or rafter (resistance against rotation) through attachments to the joist or rafter.
5. Providing closure for ends of joists or rafters.
6. Providing attachment base for siding or exterior deck ledger.

Rim board must be installed in accordance with the prescriptive provisions of the applicable code. Design of rim board installed over wall openings must be based on the reference design values noted in Table 1.

4.5 Wall Studs:

VERSA-LAM and VERSA-STUD may be used as wall stud material in accordance with the prescriptive requirements in Section 2308.9 of the IBC, Section R602 of the IRC, Section 2305 of the BNBC, Section 2308 of the SBC and Section 2320.11 of the UBC, subject to the following conditions:

1. VERSA-LAM used as wall studs must have a thickness of $1^1/_2$ inches (38 mm) or greater.
2. Cutting, notching and boring of nominally 2-by-4 and 2-by-6 VERSA-LAM studs is permitted in accordance with Sections 2308.9.10 and 2308.9.11 of the IBC, Section R602.6 of the IRC, Sections 2305.4 and 2305.5 of the BNBC, Section 2308.7 of the SBC, or Sections 2326.11.9 and 2326.11.10 of the UBC.

Allowable shear values for nailed wood structural panel shear walls utilizing VERSA-LAM framing members may be determined using Table 2306.4.1 of the IBC, Table 2306.4.6.2 of the BNBC, Table 2310.2B of the SBC or Table 23-II-I-1 of the UBC, for shear walls with framing of Douglas fir-Larch, subject to the following conditions:

1. A double VERSA-LAM stud must be used at adjoining wood structural panel edges. Studs must be stitch nailed together with two staggered rows of 0.148 inch (3.8 mm) diameter (10d common) nails spaced at 8 inches on center in each row.
2. Nails at panel edges must be staggered along two nailing lines spaced approximately $^1/_2$ inch (12.7 mm) apart. Nails at panel edges must also be at least $^3/_8$ inch (9.5 mm) from the edges of the VERSA-LAM stud and the wood structural panel.
3. The tabulated shear values for nailed wood structural panel shear walls using 8d or 10d box or common nails at a panel edge nail spacing of 2 inches (51 mm) must be multiplied by a factor of 0.90.
4. The tabulated shear values for nailed wood structural panel shear walls using 10d box or common nails at a panel edge nail spacing of 3 inches (76 mm) must be multiplied by a factor of 0.90.

VERSA-LAM wall studs are permitted as a direct replacement for solid-sawn lumber in any fire-resistance-rated wall assembly listed in Table 720.1(2) of the IBC or Table 7-B of the UBC, provided the VERSA-LAM wall studs have a minimum depth of $5^1/_2$ inches (140 mm) (nominal 2-by-6).

4.6 Installation:

VERSA-LAM and VERSA-RIM LVL must comply with this report and the wood construction requirements noted in the applicable code, as indicated in this report.

5.0 CONDITIONS OF USE

The VERSA-LAM and VERSA-RIM LVL 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 VERSA-LAM and VERSA-RIM LVL are manufactured by Boise Building Solutions Manufacturing, LLC, in White City, Oregon, and Lena, Louisiana, under a quality control program with inspections by PFS Corporation (AA-652).

5.2 The service conditions for the LVL described in this report must be a covered, dry condition of use. Dry conditions of use are those conditions of use represented by sawn lumber at which the moisture content is less than 16 percent.

5.3 Calculations and details for specific applications, demonstrating that the use of VERSA-LAM and VERSA-RIM LVL comply with this report, must be submitted to the code official upon request. The documents in question must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 Duration-of-load adjustments, as provided for wood members and their connections, may be applied in accordance with the limitations specified in the applicable code, as indicated in this report.

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

5.6 Cutting and notching of VERSA-LAM and VERSA-RIM LVL is outside the scope of this report except when used as wall studs.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with ICC-ES Acceptance Criteria for Structural Composite Lumber (AC47), dated October 2006.

6.2 Data in accordance with ICC-ES Acceptance Criteria for Wood-based Rim Board Products (AC124), dated October 2004 (editorially revised January 2008).

6.3 Data in accordance with ICC-ES Acceptance Criteria for Wood-based Studs (AC202), dated October 2003 (editorially revised December 2005).

6.4 Reports of fire tests conducted in accordance with ASTM E 119.

7.0 IDENTIFICATION

VERSA-LAM and VERSA-RIM must be identified with a stamp noting the Boise Building Solutions Manufacturing, LLC, name and plant location, the product name (including MOE and Flexural Stress), the date of manufacture, the evaluation report number (ESR-1040), and the name of the inspection agency (PFS Corporation). Unless otherwise identified, all products from White City, Oregon, are manufactured from primarily Douglas fir and all products from Alexandria, Louisiana, are manufactured from primarily southern yellow pine. VERSA-LAM and VERSA-RIM manufactured in White City, Oregon from primarily southern yellow pine or hemlock is identified with ‘SYP’ or ‘HEM’, respectively.

TABLE 1— REFERENCE DESIGN VALUES FOR VERSA-LAM (pounds per square inch)

GRADE MODULUS OF ELASTICITY, E (× 10^6)	FLEXURAL STRESS, F_b		TENSION PARALLEL TO GRAIN[2], F_t	COMP. PARALLEL TO GRAIN, F_C	COMPRESSION PERPENDICULAR TO GRAIN, F_c		HORIZONTAL SHEAR, F_v	
	Joist[1]	Plank			Perp. to Narrow Face (Plank)	Parallel to Narrow Face (Joist)	Parallel to Narrow Face (Plank)	Perp. to Narrow Face (Joist)
1.3	1600	1600	1100	2500	450	525	150	225
1.3	1750	1600	1100	2500	450	525	150	225
1.4	1800	1800	1250	2500	450	525	150	225
1.4	1950	1800	1250	2500	450	525	150	225
1.5	2050	2050	1400	2500	450	525	150	225
1.5	2250	2050	1400	2500	450	525	150	225
1.6	2250	2250	1500	2500	450	525	150	225
1.6	2450	2250	1500	2500	450	525	150	225
1.7	2400	2400	1650	3000	450	750	190	285
1.7	2650	2400	1650	3000	450	750	190	285
1.8	2500	2500	1825	3000	450	750	190	285
1.8	2750	2500	1825	3000	450	750	190	285
1.9	2600	2600	1950	3000	450	750	190	285
1.9	2850	2600	1950	3000	450	750	190	285
2.0	2800	2800	2150	3000	450	750	190	285
2.0	3100	2800	2150	3000	450	750	190	285
2.1	2900	2900	2250	3000	450	750	190	285
2.1	3200	2900	2250	3000	450	750	190	285
2.2	3100	3100	2425	3000	450	750	190	285
2.2	3400	3100	2425	3000	450	750	190	285

For **SI:** 1 psi = 0.00689 MPa.

[1]The tabulated reference flexural stress, $F_{b,}$ is for LVL with a 12-inch depth. For other depths, multiply by the size factor $C_f = (12/d)^{1/9}$, where d is the member depth in inches.
[2]The tabulated reference tension stress, F_t, is for LVL with a 4-foot length. For longer lengths, multiply by the length factor $C_L = (4/L)^{1/8}$, where L is the member length in feet.

For uniformly loaded, simple span beams, deflection is calculated as follows:

$$D = \frac{270WL^4}{Ebd^3}$$

where:

D = Deflection (inches)
W = Uniform load (plf)
L = Span (feet)
E = Modulus of elasticity (psi)
b = Beam width (inches)
d = Beam depth (inches)

TABLE 2—VERSA-LAM AND VERSA-RIM ALLOWABLE RIM BOARD DESIGN CAPACITIES[1, 2]

GRADE	MINIMUM THICKNESS (inches)	ALLOWABLE VERTICAL LOAD [3]				LATERAL CAPACITY[4,7,8,9] (lb/ft)	CONTAINS CROSS-PLY VENEER
		Distributed Load (lb/ft)		Concentrated Load ($3^1/_2$ in. Min. Width) (lb)			
		d ≤ 16	16 < d ≤ 20	d ≤ 16	16 < d ≤ 20		
1.3E - 1.6E	1	2000	N/A	N/A	N/A	190	No
	$1^1/_{16}$	2000	N/A	N/A	N/A	205	No
	$1^1/_{16}$ [10]	4250	4000	3800	3800	205	Yes
	$1^1/_8$	2000	N/A	N/A	N/A	220	No
	$1^3/_{16}$	2000	N/A	N/A	N/A	230	No
	$1^1/_4$	3250	3250	2250	2250	See Note 4	No
	$1^5/_{16}$	6000	5450	4450	4450	See Note 4	Yes
	$2^1/_4$	3250	3250	2250	2250	See Note 5	No
1.7E - 2.2E	1	4250	3700	3700	3500	190	No
	$1^1/_{16}$	4250	3700	3700	3500	205	No
	$1^1/_8$	4250	3700	3700	3500	220	No
	$1^3/_{16}$	4250	3700	3700	3500	230	No
	$1^1/_4$	4250	3700	3700	3500	See Note 4	No
2.0E - 2.2E	$1^1/_2$	5450	4300	4300	3900	See Note 4	No
	$1^3/_4$	5700	4300	4300	3900	See Note 4	No
	$2^1/_4$	5700	4300	4300	3900	See Note 5	No

For **SI:** 1 inch = 25.4 mm, 1 lb = 4.4 N, 1 lb/ft = 47.8 Pa.

[1]The rim board must be used as a continuously supported member and installed in accordance with Section 4.4.
[2] Allowable loads given in this table are not permitted to be increased by the load duration factor, C_D.
[3] d = member depth (inches).
[4]The lateral capacity (in-plane shear) is as permitted in the applicable code, as stated in this report, for solid-sawn lumber framing in horizontal wood diaphragms with nominally 2-inch-thick framing. The lateral capacity is the lesser of that shown in the applicable code, as stated in this report, or the amount shown in this table.
[5]The lateral capacity (in-plane shear) is as permitted in the applicable code for solid-sawn lumber framing in horizontal wood diaphragms with nominally 2-inch- thick framing.
[6]The lateral capacity (in-plane shear) is as permitted in the applicable code for solid-sawn lumber framing in horizontal wood diaphragms with nominally 3-inch- thick framing.
[7]VERSA-LAM and VERSA-RIM, used as rim joist, may be substituted for solid-sawn framing in horizontal wood diaphragms as shown in Table 2306.4.6.1 of the BNBC, Table 2310.2A of the SBC, Table 23-II-H of the UBC and Table 2306.3.1 of the IBC (maximum horizontal shear values must be limited as noted).
[8]Toe-nailed connections are not limited by the 150 plf lateral load capacity noted for Seismic Zones 3 and 4 in Section 2318.3.1 of the UBC, or Seismic Design Categories D, E, and F in Section 2305.1.4 of the IBC.
[9]See Table 3 for minimum nail spacing requirements.
[10] Values apply only to $1^1/_{16}$-inch VERSA-RIM.

TABLE 3—ALLOWABLE NAIL SPACING FOR VERSA-LAM AND VERSA-RIM (inches)

CONNECTOR SIZE	NAILS PARALLEL TO THE GLUE LINE								NAILS PERPENDICULAR TO THE GLUE LINE	
	Minimum Thickness 1 inch		Minimum Thickness $1^1/_4$ inches		Minimum Thickness[1] $1^3/_4$ inches		Minimum Thickness[1] $3^1/_2$ inches		All Thicknesses[1]	
	o.c.	End	o.c.	End	o.c.	End	o.c.	End	o.c.	End
8d box	3	$1^1/_2$	3	$1^1/_2$	2	1	2	$^1/_2$	2	$^1/_2$
8d common	4	3	3	2	3	2	2	1	2	1
10d & 12d box	4	3	3	2	3	2	2	1	2	1
16d box	4	3	3	2	3	2	2	1	2	1
10d & 12d common	6	4	4	3	4	3	2	2	2	2
16d sinker	6	4	4	3	4	3	2	2	2	2
16d common	6	4	6	4	6	3	2	2	2	2

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

[1]Two rows of fasteners are permitted, staggered a minimum of $^1/_2$ inch. “End” refers to the end of the piece being connected.

TABLE 4—EQUIVALENT SPECIFIC GRAVITIES FOR CONNECTOR DESIGN

PRODUCT	NAILS					
	Lateral Installed into Wide Face		Lateral Installed into Narrow Face		Withdrawal	
	Loaded Parallel to Length	Loaded Perpendicular to Length	Loaded Parallel to Length	Loaded Perpendicular to Length	Installed into Wide Face	Installed into Narrow Face
1.3-1.6E VERSA-LAM	0.42	0.42	0.42	0.42	0.42	0.42
1.7-2.2E VERSA-LAM	0.50	0.50	0.50	0.50	0.50	0.50
VERSA-RIM	0.50	0.50	0.50	0.50	0.50	0.46

PRODUCT	BOLTS			
	Lateral Installed into Wide face		Lateral Installed into Narrow Face	
	Loaded Parallel to Length	Loaded Perpendicular to Length	Loaded Parallel to Length	Loaded Perpendicular to Length
1.3-1.6E VERSA-LAM	0.38	0.38	0.34	0.34
1.7-2.2E VERSA-LAM	0.50	0.50	0.50	0.50
VERSA-RIM	0.50	0.50	0.50	0.50