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**CCMC 12472-R**

**CCMC**

*EVALUATION  
REPORT*

**DIVISION 06173**

**Issued 1993-03-02**

**Re-evaluated 2007-06-08**

**Revised 2008-01-25**

**Re-evaluation due 2008-03-02**

**Re-Evaluation  
in process**

***VERSA-LAM® LVL***

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Plants: VERSA-LAM® LVL  
White City, Oregon, USA

VERSA-LAM® LVL  
Alexandria Plant  
Lena, Louisiana, USA

## 1. Purpose of Evaluation

The proponent sought confirmation from the Canadian Construction Materials Centre (CCMC) that “VERSA-LAM® LVL” can serve as laminated veneer lumber (LVL) as an alternative solution to lumber in compliance with the National Building Code of Canada (NBC) 2005.

## 2. Opinion

Subject to the limitations and conditions stated in this report, test results and assessments provided by the proponent show that “VERSA-LAM® LVL” complies with CCMC’s Technical Guide for Structural Composite Lumber, MasterFormat number 06173, dated 05-04-05, and may serve as an alternative solution that will achieve at least the minimum level of performance required for lumber floor joists, rafters and beams in “dry service” applications<sup>(1)</sup> with respect to structural safety in:

- NBC 2005, Division B, Sections 4.1. and 4.3.,<sup>(1)</sup> and for use as beams or columns in Part 9 and Part 4 buildings.

when designed in accordance with:

- CAN/CSA-O86-01, “Engineering Design in Wood.”

Materials comply with:

- CSA O112.6-M1977, “Phenol and Phenol Resorcinol, Resin Adhesives for Wood (High Temperature Curing)”;
- CCMC’s Technical Guide for Structural Wood Adhesives (Dry Service Use), MasterFormat number 06091.1, dated 06-06-22 (see CCMC 13267-R).<sup>(1)</sup>

<sup>(1)</sup> This engineered wood product meets the requirements of the NBC 2005, Division B, Article 4.3.1.1., which references CAN/CSA-O86-01. The product conforms to Clause 13 of this Standard, except for Sentence 13.4.2.1. This Clause of CAN/CSA-O86-01 currently only references adhesives for “exterior use” even though the end-use engineered wood product is only for “dry use” applications. Hence the “exterior use” adhesive specification is beyond the environmental conditions expected. The above-mentioned CCMC Technical Guide, MasterFormat number 06091.1, has been developed for the qualification of structural wood adhesives for engineered wood products intended for “dry use” in-service applications.

Ruling No. 05-15-139 (12472-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 15 December, 2005 (revised 7 December, 2007) pursuant to s.29 of the *Building Code Act, 1992* (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

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Canada Mortgage and Housing Corporation permits the use of this product in construction financed or insured under the *National Housing Act*.

### 3. Description

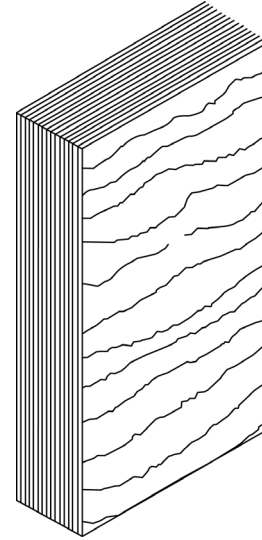
“VERSA-LAM® LVL” is manufactured by laminating veneers of Douglas fir, Southern Yellow Pine, Western Hemlock and eucalyptus. The veneers are oriented vertically in “VERSA-LAM® LVL” (see Figure 1).

All veneers run parallel to the length of the member. The 2.5-mm – 4.2-mm-thick veneers are bonded with an exterior-type adhesive (phenol formaldehyde) and formed into panels. The “VERSA-LAM® LVL” panels go through a secondary lamination using an isocyanate adhesive that was evaluated separately as a structural adhesive (see CCMC 13267-R).

“VERSA-LAM® LVL” is produced in a multitude of MOE (modulus of elasticity) and strength grades, which are outlined in Table 1.

“VERSA-LAM® LVL” must be identified by the PFS Corporation certification mark, and with the phrase “CCMC 12472-R” on each member.

The designer shall use the properties specified in Tables 1, 2 and 3.



**Figure 1.** “VERSA-LAM® LVL”

**Table 1. Specified Strengths and MOE for “VERSA-LAM® LVL” for Dry Use in-Service Conditions (MPa)**

VERSA-LAM® Grade Designation (USA)	Modulus of Elasticity $\times 10^6$ (MPa)	Specified Flexural Strength, $F_b$ (MPa)		Specified Tensile Strength <sup>(2)</sup> , $F_t$ (MPa)	Specified Compr. Strength, $F_c$ (Parallel-to- Grain) (MPa)	Specified Compr. Strength, $F_{cp}$ (Perp.-to-Grain) (MPa)		Specified Horizontal Shear Strength, $F_v$ (MPa)	
		Joist <sup>(1)</sup>	Plank			Joist	Plank	Joist	Plank
1.3E -1600F <sub>b</sub>	8 963	21.4	22.8	14.3	30.3	6.69	5.58	2.96	2.07
1.3E -1750F <sub>b</sub>		23.5	22.8	14.3	30.3	6.69	5.58	2.96	2.07
1.4E -1800F <sub>b</sub>	9 653	24.1	26.2	15.2	30.3	6.69	5.58	2.96	2.07
1.4E -1950F <sub>b</sub>		26.5	26.2	15.2	30.3	6.69	5.58	2.96	2.07
1.5E -2050F <sub>b</sub>	10 342	25.5	28.3	15.9	30.3	6.69	5.58	2.96	2.07
1.5E -2250F <sub>b</sub>		28.1	28.3	15.9	30.3	6.69	5.58	2.96	2.07
1.6E -2250F <sub>b</sub>	11 032	27.6	31.7	20.3	30.3	6.69	5.58	2.96	2.07
1.6E -2450F <sub>b</sub>		30.3	31.7	20.3	30.3	6.69	5.58	2.96	2.07
1.7E -2400F <sub>b</sub>	11 721	33.1	33.8	22.1	30.3	10.51	5.58	4.00	2.07
1.7E -2650F <sub>b</sub>		36.4	33.8	22.1	30.3	10.51	5.58	4.00	2.07
1.8E -2500F <sub>b</sub>	12 411	35.2	35.2	23.6	36.5	10.51	5.58	4.00	2.07
1.8E -2750F <sub>b</sub>		38.7	35.2	23.6	36.5	10.51	5.58	4.00	2.07
1.9E -2600F <sub>b</sub>	13 100	37.9	36.5	25.4	36.5	10.51	5.58	4.00	2.07
1.9E -2850F <sub>b</sub>		41.7	36.5	25.4	36.5	10.51	5.58	4.00	2.07
2.0E -2800F <sub>b</sub>	13 789	39.3	37.9	27.1	36.5	10.51	5.58	4.00	2.07
2.0E -3100F <sub>b</sub>		43.2	37.9	27.1	36.5	10.51	5.58	4.00	2.07
2.1E -2900F <sub>b</sub>	14 479	40.7	38.6	27.6	36.5	10.51	5.58	4.00	2.07
2.1E -3200F <sub>b</sub>		44.7	38.6	27.6	36.5	10.51	5.58	4.00	2.07
2.2E -3100F <sub>b</sub>	15 168	42.1	39.3	28.0	36.5	10.51	5.58	4.00	2.07
2.2E -3400F <sub>b</sub>		46.3	39.3	28.0	36.5	10.51	5.58	4.00	2.07

**Notes to Table 1:**

- (1) The specified flexural strength is for a 305-mm-deep (12”) LVL member. For other depths, multiply by size factor,  $K_{zb} = (305/d)^{1/9}$ , where d is the member depth in mm.
- (2) The specified tensile strength is for a 6 096-mm-long (20’) LVL member. For other lengths, multiply by length factor,  $K_L = (6096/L)^{1/8}$ , where L is the member length in mm. An increase in tension strength for lengths less than 6 096 mm (20’) is not permitted. In addition, the maximum cross-section is limited to 3 times the tested specimen’s cross-sectional area: contact the manufacturer for maximum cross-section for tension applications.

**Table 2. “VERSA-LAM® LVL” Fastener Capacities**

Fastener Property	Nail Orientation	Load Direction	Specific Gravity of Equivalent Species for Design Purposes
<b>Nail Withdrawal</b>			
All grades (1.3E - 2.2E)	Edge	Withdrawal	S-P-F, SG = 0.42
	Face	Withdrawal	Douglas fir-Larch, SG = 0.50
Lateral Nail Capacity	Nail Orientation	Load Direction	Specific Gravity of Equivalent Species for Design Purposes
VERSA-LAM® Grades (1.3E – 1.6E)	Edge	Parallel to grain	S-P-F, SG = 0.42
	Edge	Perpendicular to grain	
	Face	Parallel to grain	
	Face	Perpendicular to grain	
VERSA-LAM® Grades (1.7E – 2.2E)	Edge	Parallel to grain	S-P-F, SG = 0.42
	Edge	Perpendicular to grain	
	Face	Parallel to grain	Douglas fir-Larch, SG = 0.50
	Face	Perpendicular to grain	
Bolt Bearing Capacity	Bolt Size 12.5 mm and 19.0 mm	Load Direction	Specific Gravity of Equivalent Species for Design Purposes
VERSA-LAM® Grades (1.3E – 1.6E)	Edge	Parallel to grain	SG = 0.34
	Edge	Perpendicular to grain	
	Face	Parallel to grain	SG = 0.38
	Face	Perpendicular to grain	
VERSA-LAM® Grades (1.7E – 2.2E)	Edge	Parallel to grain	SG = 0.34
	Edge	Perpendicular to grain	
	Face	Parallel to grain	SG = 0.50
	Face	Perpendicular to grain	

**Table 3. “VERSA-LAM® LVL” Fastener Size and Spacing**

Fastener Size	Nails Parallel to the Glue Line								Nails Perpendicular to the Glueline	
	Minimum Thickness (25.4 mm)		Minimum Thickness (38.8 mm)		Minimum Thickness (44.5 mm)		Minimum Thickness (88.9 mm)		All Thicknesses <sup>(1)</sup>	
	o.c.	End	o.c.	End	o.c.	End	o.c.	End	o.c.	End
8d box	76.2	38.1	76.2	38.1	50.8	25.4	50.8	12.7	50.8	12.7
8d common	101.6	76.2	76.2	50.8	76.2	50.8	50.8	25.4	50.8	25.4
10d & 12d box	101.6	76.2	76.2	50.8	76.2	50.8	50.8	25.4	50.8	25.4
16d box	101.6	76.2	76.2	50.8	76.2	50.8	50.8	25.4	50.8	25.4
10d & 12d common	152.4	101.6	101.6	76.2	101.6	76.2	50.8	50.8	50.8	50.8
16d sinker	152.4	101.6	101.6	76.2	101.6	76.2	50.8	50.8	50.8	50.8
16d common	152.4	101.6	152.4	101.6	152.4	76.2	50.8	50.8	50.8	50.8

**Note to Table 3:**

(1) Two rows of fasteners are permitted, staggered a minimum of 12.5 mm. "End" refers to the end of the piece being connected.

**4. Usage and Limitations**

“VERSA-LAM® LVL” is permitted for use in construction as an alternative material to lumber, as is all structural composite lumber. “VERSA-LAM® LVL” is intended for structural applications such as beams, headers, joists, rafters, rim boards and columns, as outlined in the manufacturer’s technical literature mentioned below. The specific application must be qualified through specific testing and validated by the manufacturer.

For other applications such as I-joist flanges, studs, and truss chords, which are beyond the scope of this evaluation, additional testing and/or engineering is required.

The following pre-engineering has been provided to CCMC by Boise Cascade AllJoist Ltd. to demonstrate compliance to Part 9 buildings for acceptance by the local authority having jurisdiction (AHJ):

i) Boise Cascade AllJoist Ltd. Pre-engineered Tables<sup>(1)</sup>

- All structural composite lumber is intended for dry use in-service applications only.

When “VERSA-LAM® LVL” is used as roof or floor beams, headers or roof rafters, roof lintels in simple spans supporting uniform loads only, or columns, the installation shall be in accordance with the content of the Boise Cascade AllJoist Ltd.’s publications entitled “Versa-Lam® Specifier Guide, Western Canada,” 3<sup>rd</sup> edition, and “Versa-Lam® Specifier Guide, Eastern Canada,” 3<sup>rd</sup> edition.

*1. Note: the pre-engineered Tables present the pre-engineered factored resistance of the beam or column. The AHJ may require further engineering to determine the factored load in accordance with the 2005 NBC Part 4.*

“VERSA-LAM® LVL” shall be installed in accordance with Boise Cascade AllJoist Ltd. installation guidelines noted in these documents for those applications falling within the scope of the documents. Applications outside the scope of these installation guidelines shall require engineering on a case-by-case basis.

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ii) Boise Cascade AllJoist Ltd.'s Installation Details

In the attachment of "VERSA-LAM® LVL," nails or bolts shall be used and installed in accordance with the manufacturer's size and spacing specifications.

Detailed instructions on the installation of "VERSA-LAM® LVL" using special connections are available from the manufacturer.

The ends of all "VERSA-LAM® LVL" used as joists, rafters and beams shall be restrained to prevent rollover.

The compression edges of all "VERSA-LAM® LVL" used as joists, rafters and beams shall be continuously laterally supported.

iii) Engineering Required

For structural applications beyond the scope/limitations of the above-referenced Boise Cascade AllJoist Ltd publication or when required by the AHJ, the drawings or related documents shall bear the authorized seal of a professional engineer skilled in wood design and licensed to practice under the appropriate provincial or territorial legislation.

"VERSA-LAM® LVL" shall be designed in accordance with the requirements of CAN/CSA-O86-01, "Engineering Design in Wood," and Part 4 of Division B of the NBC 2005. The specified strengths and fastener limits for "VERSA-LAM® LVL" shall not exceed the values set forth in Tables 1 to 3.

The engineer shall design in accordance with CSA O86 and may use, as a guide, the *Engineering Guide for Wood Frame Construction* published by the Canadian Wood Council.

iv) Engineering Support Provided by Manufacturer

Boise Cascade AllJoist Ltd provides engineering support or a professional engineer skilled in wood design and licensed to practice under the appropriate provincial or territorial

legislation. Boise Cascade AllJoist Ltd may also be consulted in the use of this proprietary prefabricated I-joist.

Tel.: (514) 631-6331  
1-800-964-6999  
[ewp\\_canada@bc.com](mailto:ewp_canada@bc.com)

## 5. Performance

Structural testing of "VERSA-LAM® LVL" was witnessed by an independent testing agency recognized by CCMC. The tests were conducted in accordance with CCMC's Technical Guide for Structural Composite Lumber, MasterFormat number 06173, and in accordance with ASTM D 5456-01, "Standard Specification for Evaluation of Structural Composite Lumber Products." The test program is summarized below.

### Summary of Tests:

#### *Bending Strength and Stiffness*

Specimens were tested in edgewise and flatwise bending. A parametric, 5% tolerance limit with a 75% confidence level approach was used to determine the characteristic value. Qualification test data was used to establish the applicable coefficient of variation,  $CV_w$ , and the reliability normalization factor from CAN/CSA-O86-01 was used to determine the specified strength.

#### *Tension Parallel to Grain*

Single member tension tests were conducted. A parametric, 5% tolerance limit with a 75% confidence level approach was used to determine the characteristic value. Qualification test data was used to establish the applicable coefficient of variation,  $CV_w$ , and the reliability normalization factor from CAN/CSA-O86-01 was used to determine the specified strength.

#### *Compression Parallel to Grain*

Compression tests were conducted on 53 specimens. A parametric, 5% tolerance limit with a 75% confidence level approach was used to determine the characteristic value. Qualification test data was used to establish the applicable coefficient of variation,  $CV_w$ , and the reliability normalization factor from CAN/CSA-O86-01 was used to determine the specified strength.

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### ***Compression Perpendicular to Grain***

Specimens were tested and the average stress for a 1-mm deformation was determined. This value was multiplied by 1.09 to establish the design value.

### ***Shear***

Specimens were shear tested edgewise and plank. A parametric, 5% tolerance limit with a 75% confidence level approach was used to determine the characteristic value. Qualification test data was used to establish the applicable coefficient of variation,  $CV_w$ , and the reliability normalization factor from CAN/CSA-O86-01 was used to determine the specified strength.

### ***Creep and Recovery***

Thirty (30) specimens were tested in accordance with ASTM D 6815, "Standard Specification for Evaluation of Duration of Load and Creep Effects of Wood and Wood-Based Products," whereby the specimens were subjected to a 90-day creep test for duration of load, the equivalent for lumber verification. The three criteria were met and deemed equivalent to lumber.

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