CCMC CANADIAN CODE COMPLIANCE EVALUATION

CCMC 13485-R

CCMC Canadian code compliance evaluation

CCMC number:	13485-R
Status:	Active
Issue date:	2010-02-16
Modified date:	2022-11-18
Evaluation holder:	**RedBuilt, LLC** 200 E. Mallard Drive Boise ID 83706 United States Website: www.redbuilt.com/ Telephone: 866-859-6757
Product name:	RedLam™ LVL
Compliance:	NBC 2015
Criteria:	CCMC-TG-061710-15A "CCMC Technical Guide for Structural Composite Lumber"

In most jurisdictions this document is sufficient evidence for approval by Canadian authorities.
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Compliance opinion

It is the opinion of the Canadian Construction Materials Centre that the evaluated product, when used as structural composite lumber (SCL) in accordance with the conditions and limitations stated in this evaluation, complies with the following code:

National Building Code of Canada 2015

Code provision	Solution type
4.3.1.1.(1) Buildings and their structural members m ...	Acceptable
9.23.4.2.(3) Spans for built-up wood and glued-lamina ...	Alternative

The above opinion(s) is/are based on the evaluation by the CCMC of technical evidence provided by the evaluation holder, and is bound by the stated conditions and limitations. For the benefit of the user, a summary of the technical information that forms the basis of this evaluation has been included.

Product information

Product name

RedLam™ LVL

Product description

The product is manufactured by laminating veneer sheets of wood species or species combinations coated with an exterior-type adhesive conforming to CSA O112.6-M1977(R2006), “Phenol and Phenol-Resorcinol Resin Adhesives for Wood (High-Temperature Curing),” (see CCMC 13019-L) in specific lay-up patterns, which are fed into a continuous press. The wood species, species combinations, lay-up patterns and adhesives used are as specified in the manufacturer’s manufacturing standards.

The product is manufactured in thicknesses ranging from 19 mm to 89 mm, in widths ranging from 63.5 mm to 1 220 mm and in lengths up to 24.4 m.

Independent, third-party quality control inspections are conducted by PFS Corporation, Los Angeles, California.

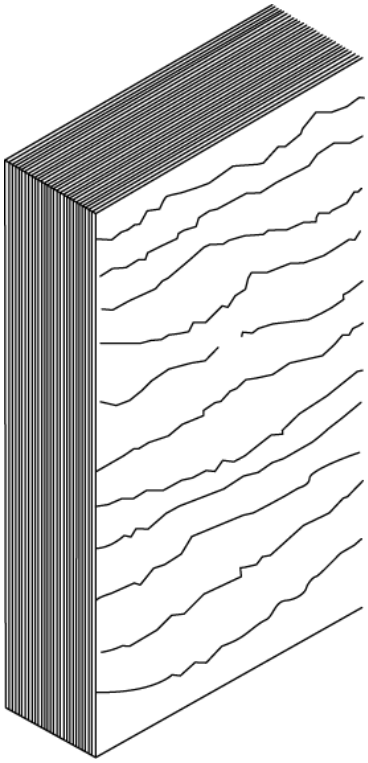

Figure 1. Joist/beam veneer orientation of RedLam™ LVL

Manufacturing plant

This evaluation is valid only for products produced at the following plant:

Product name	Manufacturing plant
	Stayton, OR, US
RedLam™ LVL	✓

✓ Indicates that the product from this manufacturing facility has been evaluated by the CCMC

Conditions and limitations

The CCMC's compliance opinion is bound by this product being used in accordance with the conditions and limitations set out below.

- The product, as with all SCL, is intended for dry service [(1)] applications only.
- The product is intended for use in construction as an alternative material to lumber. Proprietary design values presented for the product are to be used by professional engineers for design in accordance with CSA O86 for structural applications, such as beams, headers, joists, rafters and columns as intended by the product manufacturer. The specific application must be qualified through testing and validated by the manufacturer. Applications such as I-joist flanges, studs and metal-plated truss chords are beyond the scope of this evaluation.

  i. **Manufacturer's pre-engineered tables**
  There are no pre-engineered tables currently published in the product literature at this time. The spans for the product, when used as floor joists, rafters and beams, may conform to the spans for Select Structural Grade for the Douglas fir–larch group in Tables 9.23.4.2.A. to 9.23.4.2.I. of the NBC 2015 (for the same member sizes), except where a floor is required to support a concentrated load or a specified unfactored live load in excess of 1.9 kN/m^2, and in lieu of engineering design. Maximum deflections must conform to Subsection 9.4.3., Deflections, of Division B of the NBC 2015. Floor joists must be designed to meet the deflection and vibration set in the NBC for lumber.

  ii. **Manufacturer's installation details**
  The product must be installed in accordance with the manufacturer's installation guidelines engineered on a case-by-case basis.

  iii. **Engineering requirements**
  For structural applications beyond the scope and limitations of Tables 9.23.4.2.A. to 9.23.4.2.I. of the NBC 2015 or when required by the authority having jurisdiction (AHJ), the drawings or related documents must bear the authorized seal of a professional engineer skilled in wood design and licensed to practice under the appropriate provincial or territorial legislation.

  Installations beyond the scope/limitations of Sections i. and ii. of this evaluation imply, but are not limited to, the following:

  - higher loads/longer spans;
  - concentrated loads;
  - areas of high wind or high seismicity;
  - design of supporting stud members/columns or the total beam/header load exceeds the NBC 2015 pre-engineered beam/lintel tables; and
  - design of supporting foundation footings when the total load exceeds the NBC 2015 pre-engineered lumber floor/roof joist tables.

  The engineer must design in accordance with CSA O86 and may use the *Engineering Guide for Wood-Frame Construction* published by the Canadian Wood Council.

  The specified strengths for the product must not exceed the values set forth in the table "Product specified strengths (MPa)" in this evaluation. See Figure 1 above for joist/beam veneer orientation.

  The ends of all the product members used as joists, rafters and beams must be restrained to prevent rollover. This is normally achieved by attaching a diaphragm sheathing to the top or to the compression

edge, and to an end wall or shear transfer panel capable of transferring a minimum unfactored uniform load of 730 N/m or the required shear forces due to wind or seismic conditions. Blocking or cross-bracing with equivalent strength may be used.

The compression edges of all the product members used as joists, rafters and beams must be laterally supported at least every 610 mm, except where design is done in accordance with CSA O86.

Nailing of the product perpendicular to glue lines must conform to Table 9.23.3.4., Nailing for Framing, of Division B of the NBC 2015. Nails must be installed parallel to the glue lines on the narrow face of the product that is at least 19 mm thick × 89 mm wide. The nails must be spaced at a minimum of 75 mm on centre (o.c.) for 63.5 mm common nails, and 100 mm o.c. for 76 mm and 83 mm common nails and No. 14 gauge staples. Common 89 mm nails installed parallel to the glue lines on the narrow face of the product that is at least 38 mm thick × 89 mm wide must be spaced at a minimum of 200 mm o.c.

iv. **Engineering support provided by manufacturer**
The manufacturer may provide engineering services in conjunction with the manufacturer's product specification and offers the following support contact number for their Canadian operations: 1-866-859-6757.

- This product must be identified with the phrase "CCMC 13485-R" along the side of the product. This CCMC number is only valid when it appears in conjunction with the certification mark of PFS Corporation.

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1 All lumber, wood-based panels and proprietary engineered wood products are intended for dry service conditions. "Dry service condition" is defined as the in-service environment in which the average equilibrium moisture content (MC) of lumber is 15% or less over a year and does not exceed 19% at any time. Wood contained within the interior of dry, heated or unheated buildings has generally been found to have an MC between 6% and 14% depending on season and location. During construction, all wood-based products should be protected from the weather to ensure that the 19% MC is not exceeded in accordance with Article 9.3.2.5., Moisture Content, of Division B of the NBC 2015.

Technical information

This evaluation is based on demonstrated conformance with the following criteria:

Criteria number	Criteria name
CCMC-TG-061710-15A	CCMC Technical Guide for Structural Composite Lumber

The evaluation holder has submitted technical documentation for the CCMC evaluation. Testing was conducted at laboratories recognized by the CCMC. The corresponding technical evidence for this product is summarized below.

Design requirements

Table 1. Product specified strengths (MPa) (2) (9)

		Axial		Joist/beam				Plank/deck		
Material thickness	Grade species (DF/LP/WH) (1)	F_t (3)	F_c	F_b (4) (5)	F_v (6)	MOE	F_c perp (7)	F_b (8)	F_v	F_c perp (7)
19 mm to 45 mm	1.6	15.80	23.10	27.25	3.65	11 030	9.40	32.25	2.45	6.05
19 mm to 45 mm	1.8	18.50	26.15	31.15	3.65	12 410	9.40	36.80	2.45	6.05
19 mm to 45 mm	1.9	19.80	27.60	33.15	3.65	13 100	9.40	39.20	2.45	6.05
19 mm to 45 mm	2.0	21.15	29.00	35.05	3.65	13 790	9.40	41.45	2.45	6.05
19 mm to 45 mm	2.0	21.15	29.00	36.95	3.65	13 790	9.40	43.70	2.45	6.05
19 mm to 45 mm	2.2	23.75	31.60	39.00	3.65	15 170	9.40	46.05	2.45	6.05
19 mm to 45 mm	2.4	26.45	33.90	42.90	3.65	16 550	9.40	50.70	2.45	6.05
19 mm to 45 mm	2.6	29.15	36.00	46.80	3.65	17 925	9.40	55.35	2.45	6.05
46 mm to 89 mm	1.6 DF/LP/WH	15.80	23.10	24.60	3.65	11 030	9.40	29.15	2.45	6.05
46 mm to 89 mm	1.8	18.50	26.15	28.15	3.65	12 410	9.40	33.25	2.45	6.05
46 mm to 89 mm	1.9	19.80	27.60	29.90	3.65	13 100	9.40	35.35	2.45	6.05
46 mm to 89 mm	2.0	21.15	29.00	31.65	3.65	13 790	9.40	37.45	2.45	6.05
46 mm to 89 mm	2.2	23.75	31.60	35.25	3.65	15 170	9.40	41.60	2.45	6.05
46 mm to 89 mm	2.4	26.45	33.90	38.75	3.65	16 550	9.40	45.80	2.45	6.05
46 mm to 89 mm	2.6	29.15	36.00	42.25	3.65	17 925	9.40	49.95	2.45	6.05

Notes

1 DF = Douglas fir–larch, LP = lodgepole pine, WH = western hemlock. DF, LP and WH can be combined as western species (WS).

2 Specified strengths are based on covered, dry service conditions of use. Dry service conditions of use are those in which a 19% MC will not be exceeded.

3 The F_t values in the Table above are adjusted to a 20 ft. gauge length to reflect the volume effects of length, depth and thickness for a range of common application conditions. The F_t values for the product may be higher when approved by the manufacturer for use as a component of engineered products, which are manufactured under a recognized quality control program.

4 F_b values include allowances for variations in span-to-depth ratio and method of loading, and may be used without further adjustments except as noted below. For product depths other than 305 mm, regardless of thickness, multiply table values by $(305/d)^{0.136}$. Adjustments for common depths are shown below. For product depths less than 89 mm, the multiplier for the 89 mm depth shall be used.

Depth and multiplier

Depth (mm)	89	140	184	241	305	406	457	610
Multiplier	1.18	1.11	1.07	1.04	1.00	0.96	0.93	0.91

5 When structural members qualify as repetitive members in accordance with CSA O86, a 4% increase is permitted for F_b in addition to the increases permitted in Table Note 4. This increase does not apply to field-assembled, multi-member beams.

6 For simplicity, use 3.65 MPa for product depths up to 610 mm, and 3.35 MPa for product depths greater than 610 mm. When a more accurate analysis is desired, the allowable horizontal shear for all depths greater than 305 mm is $F_v = 3.65\ (305/d)^{0.065}$.

7 F_c perp shall not be increased for the duration of the load.

8 Values shown are for thicknesses up to 89 mm.

9 Simple span uniform load deflection is calculated as follows:

$\Delta = [(156WL^4 \times 10^6)/(Ebd^3)] + [(2400WL^2)/(Ebd)]$

where:

Δ = deflection, mm

E = modulus of elasticity (MOE) (shear-free), MPa

W = specified uniform load, N/m

L = span, m

b = beam width, mm

d = beam depth, mm

Table 2. Equivalent wood species for determining fastener capacities of the product

Fastener property	Nail orientation	Load direction	Specific gravity (SG) of equivalent species for design purposes
Nail withdrawal	Edge	Withdrawal	Douglas fir–larch (N), SG = 0.50
Nail withdrawal	Face	Withdrawal	Douglas fir–larch (N), SG = 0.50
Lateral nail capacity	Edge	Parallel to grain	Douglas fir–larch (N), SG = 0.50
Lateral nail capacity	Edge	Perpendicular to grain	Douglas fir–larch (N), SG = 0.50
Lateral nail capacity	Face	Parallel to grain	Douglas fir–larch (N), SG = 0.50

Fastener property	Nail orientation	Load direction	Specific gravity (SG) of equivalent species for design purposes
Lateral nail capacity	Face	Perpendicular to grain	Douglas fir–larch (N), SG = 0.50
Bolt axial capacity	—	Parallel to grain	Douglas fir–larch (N), SG = 0.50
Bolt axial capacity	—	Perpendicular to grain	Douglas fir–larch (N), SG = 0.50

The manufacturing quality assurance program has been updated to include requirements specified in ASTM D 5456, “Evaluation of Structural Composite Lumber Products,” and has been verified by independent, third-party monitoring and inspection conducted by PFS Corporation as part of the product certification.

Note: RedLam™ and RedBuilt™ are trademarks of RedBuilt LLC, Boise, ID, USA.

Appendix A

The design values obtained from testing to ASTM D 5456, “Evaluation of Structural Composite Lumber Products,” as specified in CSA O86, are summarized below.

Table 3. Additional test information for RedLam™ LVL

Property	Test information
Bending	Specimens were tested in edgewise and flatwise bending to establish the characteristic value. Data from quality control (QC) tests were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86 was used to determine the specified strength.
Shear	Specimens were tested in shear to establish the characteristic value. Data from QC tests were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86 was used to determine the specified strength.
Compression parallel to grain	Specimens were tested in compression parallel to the grain to establish the characteristic value. Data from QC tests were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86 was used to determine the specified strength.
Compression perpendicular to grain	Specimens were tested in compression perpendicular to the grain to establish the characteristic value. The characteristic value was multiplied by 1.09 to establish the specified strength in accordance with CSA O86.
Tension parallel to grain	Specimens were tested in tension to establish the characteristic value (adjusted to 20 ft. gauge length). Data from QC tests were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86 was used to determine the specified strength.
Nail withdrawal	Nail withdrawal values were established following ASTM D 1761, "Mechanical Fasteners in Wood," for an 8d common nail having a 31.75 mm penetration. Specimens were tested and equivalent species capacity was determined in accordance with ASTM D 5456, A2.4.
Nail bearing	Dowel bearing strength was determined as per ASTM D 5764, "Dowel-Bearing Strength of Wood and Wood-Based Products," using 10d common nails with a nominal diameter of 3.76 mm and a lead hole diameter of 2.77 mm. Specimens were tested and the mean bearing capacity was used to establish the equivalent species capacity as per ASTM D 5456, A2.5.
Bolt bearing>	Bolt bearing capacity was determined as per ASTM D 5764 using 12.5-mm- and 19.0-mm-diameter bolts.

Property	Test information
Creep and recovery	Creep testing was conducted in accordance with the CCMC creep and recovery test. After conditioning of the specimens, the creep and recovery performance was considered favourable. Long-term creep testing was also conducted, which demonstrated equivalency to duration of load behaviour of lumber.
Adhesive	The adhesive complies with CSA O112.6-M1977, "Phenol and Phenol-Resorcinol Resin Adhesives for Wood (High-Temperature Curing)" (see CCMC 13019-L). The heat durability of the adhesive was confirmed using ASTM D 7247-07ae1 according to ASTM D 5456-10a.

Administrative information

Use of Canadian Construction Materials Centre (CCMC) assessments

This assessment must be read in the context of the entire CCMC Registry of Product Assessments, any applicable building code or by-law requirements, and/or any other regulatory requirements (for example, the Canada Consumer Product Safety Act, the Canadian Environmental Protection Act, etc.).

It is the responsibility of the user to confirm that the assessment they are using is current and has not been withdrawn or superseded by a later version on the CCMC Registry of Product Assessments.

Disclaimer

The National Research Council of Canada (NRC) has evaluated only the characteristics of the specific product described herein. The information and opinions in this evaluation are directed to those who have the appropriate degree of experience to use and apply its contents (such as authorities having jurisdiction, design professionals and specifiers). This evaluation is valid when the product is used as part of permitted construction, respecting all conditions and limitations stated in the evaluation, and in accordance with applicable building codes and by-laws.

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Language

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The Canadian Construction Materials Centre (CCMC) assesses compliance with Canadian building, energy and safety codes. We are the only construction code compliance service supported and operated by the Government of Canada. Trusted by over 6,000 regulators across Canada.

> Most Canadian authorities having jurisdiction (AHJs) consider CCMC product assessments acceptable as evidence for product approval.

CCMC assessments are recognized by construction authorities across Canada:

Alliance of Canadian Building Official Associations (ACBOA)	(Alliance of Canadian Building Official Associations (ACBOA))
First Nations National Building Officers Association (FNNBOA)	(First Nations National Building Officers Association (FNNBOA))
Canadian Home Builders' Association (CHBA)	(Canadian Home Builders' Association (CHBA))
Alberta Building Officials Association (ABOA)	(Alberta Building Officials Associations (ABOA))
Saskatchewan Building Officials Association (SBOA)	(Saskatchewan Building Officials Association (SBOA))
Manitoba Building Officials Association (MBOA)	(Manitoba Building Officials Association (MBOA))
Ontario Building Officials Association (OBOA)	(Ontario Building Officials Association (OBOA))
New Brunswick Building Officials Association (NBBOA)	(New Brunswick Building Officials Association (NBBOA))
Nova Scotia Building Officials Association (NSBOA)	(Nova Scotia Building Officials Association (NSBOA))

> The CCMC provides code compliance assessments to Canadian code requirements, consulting nationwide with construction regulators to elicit regional variations in code requirements as well as provincial and local interpretations. Users are advised to review the technical information presented in CCMC assessments when making approval decisions. Learn more about how the CCMC provides a unique service for Canada.

For more information, contact the CCMC by phone at (613) 993-6189 or by email at ccmc@nrc-cnrc.gc.ca

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Code compliance as an acceptable solution

Code Compliance via Acceptable Solutions

> If a building design (e.g. material, component, assembly or system) can be shown to meet all provisions of the applicable **acceptable solutions** in Division B (e.g. it complies with the applicable provisions of a referenced standard), it is deemed to have satisfied the objectives and functional statements linked to those provisions and thus to have complied with that part of the Code.
>
> — **National Building Code of Canada, Sentence A-1.2.1.1.(1)(a)**

The CCMC has determined that compliance with this provision of the Code has been demonstrated as an **Acceptable Solution**. The evaluation report provides a summary of the basis of CCMC's compliance opinion.

CCMC's code compliance opinions

All CCMC evaluation reports are opinions of code compliance established in accordance with the National Building Code of Canada, Subsection 1.2.1. "Compliance with this Code," which requires compliance to be achieved by:

- complying with the applicable acceptable solutions in Division B, or
- using an alternative solution that will achieve at least the minimum level of performance required by Division B in the areas defined by the objective and functional statements attributed to the applicable acceptable solutions.

The CCMC assesses compliance with Canadian building, energy and safety codes, and is trusted by over 6,000 regulators across Canada.

Code compliance as an alternative solution

Code Compliance via Alternative Solutions

> Where a design differs from the acceptable solutions in Division B, then it should be treated as an "**alternative solution**." A proponent of an alternative solution must demonstrate that the alternative solution addresses the same issues as the applicable acceptable solutions in Division B and their attributed objectives and functional statements. However, because the objectives and functional statements are entirely qualitative, demonstrating compliance with them in isolation is not possible. Therefore, Clause 1.2.1.1.(1)(b) identifies the principle that Division B establishes the quantitative performance targets that alternative solutions must meet. In many cases, these targets are not defined very precisely by the acceptable solutions [...] Nevertheless, Clause 1.2.1.1.(1)(b) makes it clear that an effort must be made to demonstrate that an alternative solution will perform as well as a design that would satisfy the applicable acceptable solutions in Division B—not “well enough” but “as well as.”
>
> — **National Building Code of Canada, Sentence A-1.2.1.1.(1)(b)**

The CCMC has determined that compliance with this provision of the Code has been demonstrated as an **Alternative Solution**. The evaluation report provides a summary of the basis of CCMC's compliance opinion.

CCMC's code compliance opinions

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