

CCMC 13006-R

CCMC Canadian code compliance evaluation

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Status:	Active
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Evaluation holder:	<p>Pacific Woodtech Corporation 1850 Park Lane Burlington WA 98233 United States Website: www.pacificwoodtech.com Telephone: 360-707-2200</p>
Product name:	Pacific Woodtech LVL
Compliance:	NBC 2015
Criteria:	CCMC-TG-061710-15A, "CCMC Technical Guide for Structural Composite Lumber"

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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 ...	<u>Acceptable</u>
9.23.4.2.(3) Spans for built-up wood and glued-lamina ...	<u>Alternative</u>

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

Pacific Woodtech LVL

Product description

Pacific Woodtech LVL (see [Figure 1](#)) is manufactured by laminating Douglas Fir veneer sheets coated with a phenolic adhesive in specific lay-up patterns in a continuous press with all grain oriented parallel to the length of the member. The ends of the veneer sheets are either butt- or scarf-cut according to the requirements of the lay-up pattern, then lapped. The lay-up patterns and adhesives used are as specified in Pacific Woodtech Corporation's "Quality Control Manual for Laminated Veneer Lumber."

The product is available in thicknesses ranging from 19 mm to 178 mm, depths from 44 mm to 1 219 mm, and lengths up to 20.3 m. Products with a thickness greater than 89 mm are fabricated by means of a secondary face-bonding process.

The phenol-formaldehyde (PF) adhesive used in the manufacture of this laminated veneer lumber (LVL) complies with CSA O112.6-M1977, "Phenol and Phenol-Resorcinol Resin Adhesives for Wood (High-Temperature Curing)." A phenol resorcinol formaldehyde (PRF) adhesive (Momentive 4001/5830 hardener), used in the secondary face-bonding process at a certified laminating plant, conforms to CSA O112.9-10, "Adhesives for Structural Wood Products (Exterior Exposure)." LT75/FM260 PRF adhesive, used in the secondary face-bonding process when face-bonded at another certified laminating plant, conforms to CSA O112.7-1960, "Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing)."

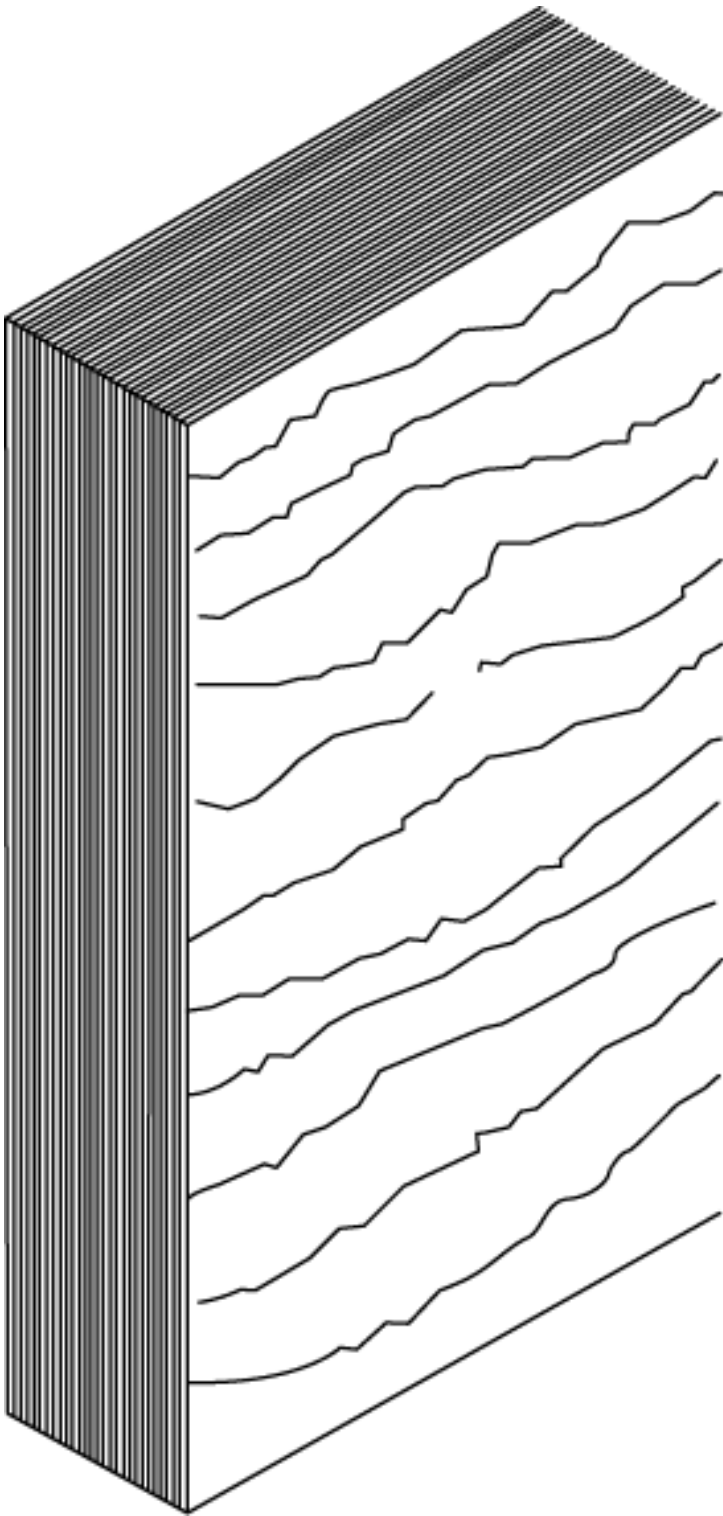


Figure 1. Pacific Woodtech LVL

Manufacturing plant

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

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Product name	Manufacturing plant
	Burlington, WA, US
Pacific Woodtech 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 applications only. ⁽¹⁾
- The product is intended for use in construction as an alternative material to lumber. Proprietary design values are presented for Pacific Woodtech LVL to be designed by professional engineers in accordance with CSA O86-14 (Update No. 1), "Engineering Design in Wood," for structural applications such as beams, headers, joists, rafters and columns as intended by the product manufacturer. The specific application must be qualified through specific 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.
- The pre-engineered tables in the literature outlined below have been provided to the CCMC by Pacific Woodtech Corporation to demonstrate compliance with Part 9 buildings for acceptance by the local authority having jurisdiction (AHJ).

i. **Manufacturer's pre-engineered tables** ⁽²⁾

When Pacific Woodtech LVL is used as floor beams or headers in simple spans supporting uniform loads only, or as columns, the installation shall be in accordance with the Pacific Woodtech Corporation publication entitled "PWLVL Headers & Beams - Limit States Design User's Guide," dated 19 June 2017.

The product shall be installed in accordance with Pacific Woodtech Corporation's installation guidelines as 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.

ii. **Manufacturer's installation details**

In the attachment of Pacific Woodtech LVL, nails and bolts shall be used and installed in accordance with the manufacturer's size and spacing specifications.

The ends of all Pacific Woodtech LVL beams shall be restrained to prevent rollover.

The compression edges of all Pacific Woodtech LVL beams shall be continuously laterally supported to prevent lateral displacement and rotation.

iii. **Engineering required**

For structural applications beyond the scope/limitations of the above-referenced Pacific Woodtech Corporation 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 practise under the appropriate provincial or territorial legislation.

Pacific Woodtech LVL shall be designed in accordance with the requirements of CSA O86-14 (Update No. 1) and Part 4 of Division B of the NBC 2015. The specified strengths and fastener limits for Pacific Woodtech LVL shall not exceed the values set forth in the tables in the Technical information section of

this evaluation. The designer shall use the properties specified in the tables in the [Technical information](#) section of this evaluation in accordance with CSA O86-14 (Update No. 1).

The engineer shall design in accordance with CSA O86-14 (Update No. 1), and may use the “Engineering Guide for Wood Frame Construction,” published by the Canadian Wood Council, as a guide.

iv. **Engineering support provided by manufacturer**

Pacific Woodtech Corporation provides engineering support and may be consulted using the contact information in the Evaluation holder section of this evaluation.

- The product must be identified with the phrase “CCMC 13006-R” along the side of the product. This CCMC number is only valid when it appears in conjunction with the APA EWS certification mark.

Notes:

- 1 All lumber, wood-based panels and proprietary engineered wood products are intended for “dry service conditions.” “Dry service” is defined as the in-service environment under 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 of 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.
 - 2 The pre-engineered tables present the pre-engineered factored resistance of the beams and columns, as well as the maximum unfactored uniform load, in accordance with Part 4 of Division B of the NBC 2015.
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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's evaluation. Testing was conducted at laboratories recognized by the CCMC. The corresponding technical evidence for this product is summarized below.

Design requirements

NBC 2015 compliance data for Pacific Woodtech LVL on which the CCMC based its [Code compliance opinion](#):

Table 1. Specified strengths (limit states design) for Pacific Woodtech LVL (MPa) ⁽¹⁾

Mechanical properties		Grade	
		2 250F _b -1.5E	3 100F _b -2.0E
Bending	f _b – joist ⁽²⁾	28.7	39.5
	f _b – plank ⁽³⁾	28.7	39.5
Tension parallel to grain, f _t ⁽⁴⁾		16.3	22.8
Compression parallel to grain, f _c		21.5	30.3
Compression perpendicular to grain, f _c	parallel to the glue line (joist)	9.4	10.7
	perpendicular to the glue line (plank)	8.1	8.1
Horizontal shear, f _v	perpendicular to the glue line (joist)	2.9	3.7
	parallel to the glue line (plank)	1.8	1.8
Apparent modulus of elasticity (MOE) ⁽⁵⁾	apparent MOE – joist	10 343	13 790
	apparent MOE – plank	10 343	13 790
True (shear free) modulus of elasticity (MOE)	true MOE – joist	11 032	14 479
	true MOE – plank	11 032	14 479

Notes

- 1 All specified strengths are based on CSA O86-14 (Update No. 1). Standard term K_D = 1.0. Dry service use K_S = 1.0.
- 2 For depths greater than or equal to 44 mm, multiply by (305/d)^{1/5}; for depths less than 44 mm, multiply by 1.47, where d = depth in joist orientation (mm).
- 3 For depths greater than or equal to 44 mm, multiply by (44/d)^{1/3}; for depths less than 44 mm, multiply by 1.00, where d = depth in plank orientation (mm).

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- 4 Tension values are adjusted to a reference length of 6 096 mm. For lengths greater than or equal to 1 219 mm, multiply by $(6\ 096/L)^{1/10}$; for lengths less than 1 219 mm, multiply by 1.17, where L = length in mm.
- 5 In the calculation of compressive resistance parallel to grain, E_{05} is the fifth percentile of the apparent MOE and is to be determined in accordance with Cl.15.3.3.5 of CSA O86.

Table 2. Pacific Woodtech LVL fastener capacities

Fastener property	Nail orientation or bolt size	Load direction	Specific gravity (SG) of equivalent species for design purposes
Nail withdrawal	edge	withdrawal	Western Hemlock, SG = 0.47
	face	withdrawal	Douglas Fir, SG = 0.50
Nail lateral capacity	edge	parallel to grain	Douglas Fir, SG = 0.50
		perpendicular to grain	
	face	parallel to grain	
		perpendicular to grain	
Bolt bearing capacity	12.5 mm	parallel to grain	Douglas Fir, SG = 0.50
		perpendicular to grain	
	19.0 mm	parallel to grain	
		perpendicular to grain	

This evaluation is applicable only to Pacific Woodtech LVL labeled with the APA certification mark and the phrase “CCMC 13006-R” on each beam or header member.

The manufacturing quality assurance program has been adapted to include requirements specified in ASTM D 5456, “Standard Specification for Evaluation of Structural Composite Lumber Products,” and is verified by APA – The Engineered Wood Association as part of the product certification. APA conducts monthly audits of the manufacturing plants and the quality assurance program.

Additional information

The design values obtained from testing to ASTM D 5456-14b as specified in CSA O86-14 (Update No. 1), “Engineering Design in Wood,” are summarized below. The manufacturer’s published pre-engineered beam and header spans were then designed in accordance with CSA O86-14 (Update No. 1).

Table 3. Additional test information for Pacific Woodtech LVL

Property	Test information
Bending	<p>Specimens were tested in edgewise and flatwise bending for qualification and for establishing volume effects. A non-parametric, 5% tolerance limit with 75% confidence level approach was used to determine the characteristic value. Qualification test data have been used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86-14 was used to determine the specified strength.</p> <p>True (shear free) modulus of elasticity (MOE) was determined by testing a total of two hundred and forty 2.0E specimens of different sizes and analyzing data following the procedures of Sections 45 through 52 of Appendix X4 of ASTM D198-15, "Standard Test Methods of Static Tests of Lumber in Structural Sizes". The results also justified 1.5E true MOE values. Values more conservative than those justified were chosen for simplicity.</p>
Shear	<p>Specimens were tested edgewise and flatwise orientation. A non-parametric, 5% tolerance limit with 75% confidence level approach was used to determine the characteristic value. Qualification test data have been used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86-14 was used to determine the specified strength.</p>
Compression perpendicular to grain (edgewise)	<p>Specimens were tested edgewise and the average stress at a 1.0-mm deformation was determined. This value was multiplied by 1.09 to establish the specified strength.</p>
Compression perpendicular to grain (flatwise)	<p>Specimens were tested flatwise and the lower of the average stress at 1.0-mm deformation or the average stress at the proportional limit was determined in accordance with ASTM D 5456-14b. This value was multiplied by 1.81 to establish the specified strength in accordance with CSA O86-14 (Update No. 1).</p>
Compression parallel to grain	<p>Specimens were tested and a non-parametric, 5% tolerance limit with 75% confidence level approach was used to determine the characteristic value. Qualification test data have been used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86-14 was used to determine the specified strength.</p>
Tension parallel to grain	<p>Specimens were tested in tension for qualification and to establish volume effects. A non-parametric, 5% tolerance limit with 75% confidence level approach was used to determine the characteristic value. Qualification test data have been used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86-14 was used to determine the specified strength.</p>
Nail withdrawal	<p>Nail withdrawal values were established following ASTM D1761-06, "Standard Test Methods for Mechanical Fasteners in Wood," for an 8d common nail having a 31.75-mm penetration. Twenty specimens were tested and the equivalent specific gravity along with the equivalent species combination was determined in accordance with ASTM D 5456-01, A2.</p>
Nail bearing	<p>Dowel bearing strength was determined as per ASTM D 5764-95, "Standard Test Method for Evaluating Dowel-Bearing Strength of Wood and Wood-Based Products," with 10d common nails with a nominal diameter of 3.76 mm and a lead hole diameter of 2.77 mm. Forty specimens (10 specimens for four combinations of load direction) of each LVL were tested and the mean bearing capacity was used to establish the equivalent specific gravity and equivalent species combination as per ASTM D 5456-01, A2.</p>
Bolt bearing	<p>Bolt bearing capacity as per ASTM D 5764-95 with 12.5-mm and 19.0-mm bolts was determined. Twenty specimens (10 specimens for two combinations) of each LVL were tested and the mean bolt bearing capacity was used to establish the equivalent specific gravity and equivalent species combination as per ASTM D 5456-01, A2.</p>

Property	Test information
Creep and recovery	Thirty specimens of Pacific Woodtech LVL were tested within a three-month creep and recovery test program, resulting in acceptable performance demonstrating equivalency to duration of load behavior of lumber.
Adhesive	The phenol-formaldehyde adhesive used in the manufacture of this LVL complies with CSA O112.6-M1977, "Phenol and Phenol-Resorcinol Resin Adhesives for Wood (High-Temperature Curing)." See CCMC 13019-L. A phenol resorcinol formaldehyde adhesive (Momentive 4001 / 5830 hardener), used in the secondary face-bonding process when face-bonded at a certified laminating plant, conforms to CSA O112.9-10, "Adhesives for Structural Wood Products (Exterior Exposure)." See CCMC 13522-L. LT75/FM260 phenolic resorcinol formaldehyde adhesive, used in the secondary face-bonding process when face-bonded at another certified laminating plant, conforms to CSA O112.7-1960, "Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing)."
Bond quality	The bond quality was evaluated in accordance with Section 6.7.2 of ASTM D 5456-10a based on longitudinal shear (block shear) tests per Section 14 of ASTM D 143. The test results confirmed the longitudinal (flatwise) shear design value of $2\ 350F_b-1.9E$ and evaluated the percentage of wood failure. The average percentage of wood failure tested was deemed to be acceptable (no less than 85%).
Product durability	The product durability was evaluated in accordance with Section 6.8.1 of ASTM D 5456-10a based on the single vacuum-pressure-soak cycle edgewise bending tests. The test results indicated that the $3\ 100F_b-2.0E$ LVL met the ASTM D 5456 edgewise bending durability requirement, which requires the average strength retention to be at least 75%.

Administrative information

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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.).

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

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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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- complying with the applicable acceptable solutions in Division B, or
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