Evaluation Report CCMC 13006-R
Pacific Woodtech LVL

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Re-evaluation in progress	

1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "Pacific Woodtech LVL", when used as structural composite lumber (SCL) in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code 2005:

- Clause 1.2.1.1.(1)(a), Division A, using the following acceptable solutions from Division B:
  - Sentence 4.3.1.1.(1), (for SCL qualification)

- Clause 1.2.1.1.(1)(b), Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
  - Sentence 9.23.4.2.(3), (i.e. beams and headers)

This opinion is based on CCMC's evaluation of the technical evidence in Section 4 provided by the Report Holder.

2. 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."

"Pacific Woodtech LVL" is available in thicknesses ranging from 19 mm to 89 mm, depths from 44 mm to 610 mm, and lengths up to 20.3 m.

The phenol-formaldehyde adhesive complies with CSA O112.6-M1977, "Phenol and Phenol Resorcinol Resin Adhesives for Wood (High Temperature Curing)."

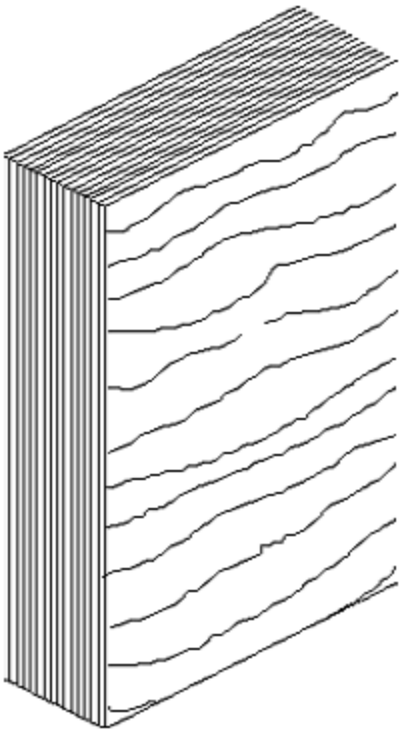

Figure 1. “Pacific Woodtech LVL.”

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the “Pacific Woodtech LVL” being used in accordance with the conditions and limitations set out below.

“Pacific Woodtech LVL,” as with all SCL, is intended for dry service applications only. [1]

“Pacific Woodtech LVL” 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 CAN/CSA-O86-01, 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 has been provided to CCMC by Pacific Woodtech Corporation to demonstrate compliance to Part 9 buildings for acceptance by the local authority having jurisdiction (AHJ):

i. **Pacific Woodtech Corp. 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 content of the Pacific Woodtech Corporation’s publication entitled “PWLVL Headers & Beams - Limit States Design User’s Guide,” dated 10-12-07.

“Pacific Woodtech LVL” shall be installed in accordance with Pacific Woodtech Corporation’s 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.

ii. **Pacific Woodtech Corp’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.

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 practice under the appropriate provincial or territorial legislation.

"Pacific Woodtech LVL" shall be designed in accordance with the requirements of CAN/CSA-O86-01 and Part 4 of Division B of the NBC 2005. The specified strengths and fastener limits for "Pacific Woodtech LVL" shall not exceed the values set forth in Tables 1 and 2. The designer shall use the properties specified in Tables 4.1.1 and 4.1.2 in accordance with CAN/CSA-O86-01.

The engineer shall design in accordance with CAN/CSA-O86-01, 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**

Pacific Woodtech Corporation provides engineering support and may be consulted at:

Telephone: 360-707-2200
Fax: 360-707-2211
www.pacificwoodtech.com

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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 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 a MC between 6% and 14% according to 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 the NBC 2005, Division B, Article 9.3.2.5.

2 The pre-engineered Tables present the pre-engineered factored resistance of the beams and columns, as well as the maximum un-factored uniform load in accordance with the NBC 2005, Division B, Part 4.

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4. Technical Evidence

The Report Holder has submitted technical documentation for CCMC's evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

4.1 Design Requirements

NBC 2005 Compliance Data for "Pacific Woodtech LVL" on which CCMC Based its Opinion in Section 1

Table 4.1.1 Specified Strengths (Limit States Design) for "Pacific Woodtech LVL" (MPa)[1]

Mechanical Properties		2 250F_b-1.5E	2 750F_b-1.8E	3 100F_b-2.0E
Flexural stress	f_b[2] - joist	28.7	35.0	39.5
	f_b[3] - plank	28.7	35.0	39.5
Tension parallel to grain, f_t[4]		16.3	21.2	22.8
Compression parallel to grain, f_c		21.5	25.3	30.3
Compression perp. to grain, f_c	parallel to the glue line (joist)	9.4	10.7	10.7
	perp. to the glueline (plank)	5.6	5.6	5.6

Table 4.1.1 Specified Strengths (Limit States Design) for "Pacific Woodtech LVL" (MPa)[1] (cont.)

Mechanical Properties		2 250F_b-1.5E	2 750F_b-1.8E	3 100F_b-2.0E
Horizontal shear, F_v	perp. to the glue line (joist)	2.9	3.7	3.7
	parallel to the glue line (plank)	1.8	1.8	1.8
Modulus of elasticity	MOE - joist	10 343	12 411	13 790
	MOE - plank	10 343	12 411	13 790

Notes for table 4.1.1

1 All specified strengths are based on CAN/CSA-O86-01. Standard term K_D= 1.0. Dry service use K_s = 1.0.

2 For depths other than 305 mm, multiply by $(305/d)^{1/5}$applicable to a minimum depth of 44 mm. Where d = depth (mm).

3 For depths other than 44 mm, multiply by $(44/d)^{1/5}$applicable to a minimum depth of 44 mm. Where d = depth (mm).

4 Tension values adjusted to a specified length of 6 096 mm (20'), for other lengths multiply by $(6\,096/L)^{1/10}$.

Table 4.1.2 "Pacific Woodtech LVL" Fastener Capacities

Fastener Property		Nail Orientation or Bolt Size	Load Direction	Specific Gravity of Equivalent Species For Design Purposes
PW LVL	Nail withdrawal	Edge	Withdrawal	Western Hemlock, SG = 0.47
		Face	Withdrawal	Douglas fir, SG = 0.50
	Lateral nail 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 Report is applicable only to "Pacific Woodtech LVL" labeled with the APA – EWS 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 5456-01, "Standard Specification for Evaluation of Structural Composite Lumber Products," and is verified by APA – The Engineered Wood Association as part of the product certification. The APA – The Engineered Wood Association conducts monthly audits of the manufacturing plants and the quality assurance program.

Report Holder

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Plant(s)

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Disclaimer

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2014-05-23

APPENDIX

The design values obtained from testing to ASTM D 5456-01 as specified in CAN/CSA-O86-01, "Engineering Design in Wood," are summarized below. The manufacturer's published pre-engineered beam and header spans were then designed in accordance with CAN/CSA-O86-01.

Table A1. Additional Test Information for "Pacific Woodtech LVL "

Property	Test Information
Bending	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 CAN/CSA-O86-01 was used to determine the specified strength.
Shear	Specimens were tested edgewise and plank 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 CAN/CSA-O86-01 was used to determine the specified strength.
Compression parallel to grain	Specimens were tested both edgewise and flatwise and the average stress for a 1-mm deformation was determined. This value was multiplied by 1.09 to establish the design value.
Compression perpendicular to grain	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 CAN/CSA-O86-01 was used to determine the specified strength.
Tension parallel to grain	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 CAN/CSA-O86-01 was used to determine the specified strength.
Nail withdrawal	Nail withdrawal values were established following ASTM D 1761-06, "Standard Test Methods for Mechanical Fasteners in Wood," for an 8d common nail having a 31.75-mm penetration. Twenty specimens were tested and equivalent species capacity was determined in accordance with ASTM D 5456-01, A2.
Nail bearing	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 species capacity as per ASTM D 5456-01, A2.
Bolt bearing	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 species capacity as per ASTM D 5456-01, A2.
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 behaviour of lumber.