



# Evaluation Report

## CCMC 11518-R

<b>MASTERFORMAT</b>	06 17 10
Issued	1987-06-03
Re-evaluated	2007-06-22
Revised	2008-11-14
Re-evaluation due	2009-04-27

---

# LP<sup>®</sup> SolidStart<sup>®</sup> LVL

## 1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “LP<sup>®</sup> SolidStart<sup>®</sup> 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 of Canada (NBC) 2005:

- Clause 1.2.1.1.(1)(a), Division A, as an acceptable solution required by Division B in:
  - Sentence 4.3.1.1.(1), (i.e. CSA O86(S1-05), Supplement #1 to CAN/CSA-O86-01, “Engineering Design in Wood,” 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 solution:
  - 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 4.1 provided by the Report holder.

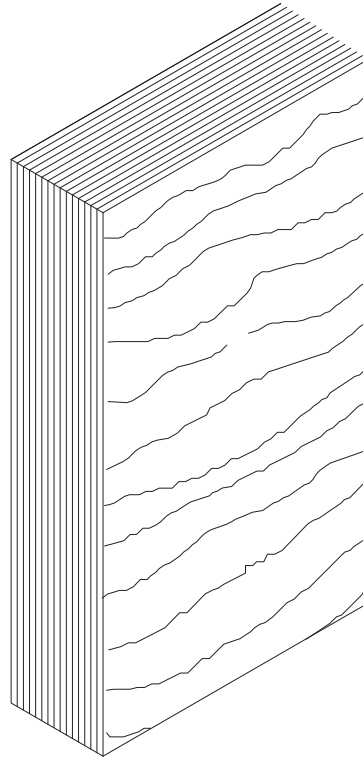
Ruling No. 05-14-138 (11518-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 05-12-15 pursuant to s.29 of the Building Code Act, 1992 (see Ruling for terms and conditions).

## 2. Description

“LP<sup>®</sup> SolidStart<sup>®</sup> LVL” (see Figure 1) is made up of layers of wood veneers laminated together using an exterior-type structural adhesive. The wood veneer properties and species, adhesive, manufacturing parameters, and finished product thickness, width and length are as specified in the quality control manual that contains the manufacturing standard. “LP<sup>®</sup> SolidStart<sup>®</sup> LVL” is also available in larger sections fabricated through secondary laminations.

The manufacturing quality assurance program and records are verified by APA-The Engineered Wood Association as part of the product certification.

The permitted design values are outlined in Tables 4.1.1 to 4.1.4.



**Figure 1. A block of “LP® SolidStart® LVL”**

### **3. Conditions and Limitations**

CCMC’s compliance opinion in Section 1 is bound by the “LP® SolidStart® LVL” being used in accordance with the conditions and limitations set out below.

“LP® SolidStart® LVL,” as with all SCL, is intended for dry service applications only.<sup>(1)</sup>

“LP® SolidStart® LVL” is intended for use in construction as an alternative material to lumber. Proprietary design values are presented for “LP® SolidStart® LVL” to be designed by professional engineers in accordance with CAN/CSA-O86-01 for structural applications such as beams, headers, joists, rafters, rimboards and columns as intended by the product manufacturer. The specific application must be qualified through specific testing and validated by the manufacturer for the specific use. For applications such as I-joist flanges, studs and metal-plated truss chords, these are beyond the scope of this evaluation.

*(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.*

The pre-engineered tables in the literature outlined below has been provided to CCMC by Louisiana-Pacific Corp. to demonstrate compliance to Part 9 buildings for acceptance by the local authority having jurisdiction (AHJ):

i) “LP<sup>®</sup> SolidStart<sup>®</sup> LVL’s” Pre-engineered Tables<sup>(2)</sup>

When “LP<sup>®</sup> SolidStart<sup>®</sup> LVL” is used as roof and floor beams, headers, in simple or continuous spans, roof rafters and roof lintels, supporting uniform loads only, the installation must be in accordance with the tables and installation details published by Louisiana-Pacific Corp. entitled:

- “LP LVL 2 950F<sub>b</sub>– 2.0E, 2 650F<sub>b</sub>– 1.9E, 2 400 F<sub>b</sub>– 1.7E, 2 250F<sub>b</sub>– 1.5E Technical Guide-Limit States Design,” dated 03/06,
- “Limit States Design Values – Rim Board Applications for 1.3E Lodgepole Pine LVL w/o Cross-band (Golden B.C.), dated April 25, 2008 and
- “Gang-Lam W LVL Rim Board Technical Data,” dated June 2002

“LP<sup>®</sup> SolidStart<sup>®</sup> LVL” shall be installed in accordance with Louisiana-Pacific Corp.’s installation guidelines noted in the above-mentioned 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.

(2) The pre-engineered Tables present the pre-engineered factored resistance of the beam. The AHJ may require further engineering to determine the factored load in accordance with the NBC 2005, Division B, Part 4.

(3) *As per the NBC 2005, Division B, Section 9.4., particularly in areas of high wind and high seismicity, the adequacy of the rim board to transfer loads from shear walls and the diaphragm must be verified.*

ii) Louisiana-Pacific Corp.’s Installation Details

Louisiana-Pacific Corp.’s pre-engineered details within the documents outlined in 3(i) above are limited in scope to building designs where the anticipated loads on the following structural details will not be exceeded:

- headers supporting roof;
- ridge beams;
- headers supporting floor and roof;
- floor girder beams;
- bearing length details;
- nail spacing;
- allowable holes;
- multiple member connections; and
- rimboard details

iii) Engineering Required

For structural applications beyond the scope/limitations of the above-referenced Louisiana-Pacific’s publications 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.

Installations beyond the scope/limitations of 3(i) and 3(ii) imply, but are not limited to, the following:

- higher loads/longer spans than the manufacturer’s pre-engineered details;
- concentrated loads;
- areas of high wind or high seismicity;
- design of supporting members/columns when the total beam/header load exceeds the NBC 2005 pre-engineered beam/lintel tables; and

- design of supporting foundation footings when the total load exceeds the NBC 2005 pre-engineered floor/roof joist tables.

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.

The specified strengths for “LP<sup>®</sup> LVL” shall not exceed the values set forth in Table 4.1.1. See Figure 1 for details about strand orientation.

Nailing spacing of “LP<sup>®</sup> SolidStart<sup>®</sup> LVL” shall conform to Table 4.1.3. Basic nail, bolt and lag screw capacities shall be as shown in Table 4.1.2.

The ends of all “LP<sup>®</sup> SolidStart<sup>®</sup> LVL” members used as joists, rafters and beams shall be restrained to prevent rollover. This is normally provided by diaphragm sheathing attached to the top or the compression edge, and 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 “LP<sup>®</sup> SolidStart<sup>®</sup> LVL” members used as joists, rafters and beams shall be laterally supported at least every 610 mm, except where design is done in accordance with CAN/CSA-O86-01.

#### iv) Engineering Support Provided by Manufacturer

Louisiana-Pacific Corp. provides engineering support through either Taiga Forest Products or a professional engineer skilled in wood design and licensed to practice under the appropriate provincial or territorial legislation. Louisiana-Pacific Corp. may also be consulted in the use of “LP<sup>®</sup> SolidStart<sup>®</sup> LVL”.

Taiga Forest Products (tech. support): (905) 858-1300  
mmerhar@taigabuilding.com

Louisiana-Pacific Corp. (tech. support): (888) 820-0325  
customer.support@lpcorp.com

“LP<sup>®</sup> LVL” products must be identified with the phrase “CCMC 11518-R” on the products. This CCMC number is only valid when it appears in conjunction with the certification mark of APA-The Engineered Wood Association.

## **4. Technical Evidence**

CCMC’s Technical Guide for “Structural Composite Lumber” sets out the nature of the technical evidence required by CCMC to enable it to evaluate a product as an alternative solution in compliance with the NBC 2005. The Report holder has submitted test results for CCMC’s evaluation. Testing was witnessed by an independent testing agency recognized by CCMC. The corresponding test results for “LP<sup>®</sup> SolidStart<sup>®</sup> LVL” are summarized below.

**4.1 NBC 2005 Compliance Data for “LP® SolidStart® LVL” on which CCMC Based its Opinion in Section 1**

**Table 4.1.1. Specified Strengths<sup>(1)(2)(3)(4)</sup> for “LP® SolidStart® LVL” (MPa)**

Grade	Bending $F_b$		Tension Parallel to Grain, $F_t$	Compression Parallel to Grain, $F_{c//}$	Compression Perpendicular to Grain, $F_{c\perp}$		Horizontal Shear, $F_v$		Modulus of Elasticity	
	MPa (psi)				MPa (psi)	MPa (psi)	MPa (psi)		MPa (psi)	
	Beam	Plank	Beam	Plank			Beam	Plank	Beam	Plank
1 400F <sub>b</sub> - 1.1E cross-ply	17.84 <sup>(1)</sup> (2 587 <sup>(1)</sup> )	17.84 (2 587)	12.38 <sup>(3)</sup> (1 796 <sup>(3)</sup> )	18.71 (2 713)	8.53 (1 238)	5.66 (820)	3.20 (465)	0.784 (114)	7 580 (1.10)	6 900 (1.00)
1 650F <sub>b</sub> - 1.3E cross-ply	21.02 <sup>(1)</sup> (3 049 <sup>(1)</sup> )	21.02 (3 049)	12.38 <sup>(3)</sup> (1 796 <sup>(3)</sup> )	18.71 (2 713)	8.53 (1 238)	5.66 (820)	3.20 (465)	1.79 (260)	8 960 (1.30)	7 580 (1.10)
1 750F <sub>b</sub> - 1.3E cross-ply	22.30 <sup>(1)</sup> (3 234 <sup>(1)</sup> )	22.30 (3 234)	12.38 <sup>(3)</sup> (1 796 <sup>(3)</sup> )	18.71 (2 713)	8.53 (1 238)	5.66 (820)	3.20 (465)	1.79 (260)	8 960 (1.30)	8 960 (1.30)
2 000F <sub>b</sub> - 1.3E	25.48 <sup>(2)</sup> (3 696 <sup>(2)</sup> )	25.48 (3 696)	12.38 <sup>(3)</sup> (1 796 <sup>(3)</sup> )	25.86 (3 751)	8.53 (1 238)	6.28 (910)	3.20 (465)	1.79 (260)	8 960 (1.30)	8 960 (1.30)
2 250F <sub>b</sub> - 1.5E	28.67 <sup>(2)</sup> (4 158 <sup>(2)</sup> )	28.03 (4 066)	13.93 <sup>(3)</sup> (2 021 <sup>(3)</sup> )	25.86 (3 751)	9.41 (1 365)	6.28 (910)	3.65 (530)	1.79 (260)	10 340 (1.50)	9 650 (1.40)
2 400F <sub>b</sub> - 1.7E	30.58 <sup>(2)</sup> (4 435 <sup>(2)</sup> )	29.31 (4 250)	13.93 <sup>(3)</sup> (2 021 <sup>(3)</sup> )	25.86 (3 751)	9.41 (1 365)	6.28 (910)	3.65 (530)	1.79 (260)	11 720 (1.70)	11 720 (1.70)
2 600F <sub>b</sub> - 1.7E	33.13 <sup>(2)</sup> (4 805 <sup>(2)</sup> )	33.13 (4 805)	13.93 <sup>(3)</sup> (2 021 <sup>(3)</sup> )	25.86 (3 751)	9.41 (1 365)	6.28 (910)	3.65 (530)	1.79 (260)	11 720 (1.70)	11 720 (1.70)
2 650F <sub>b</sub> - 1.8E	33.77 <sup>(2)</sup> (4 897 <sup>(2)</sup> )	33.13 (4 805)	16.51 <sup>(3)</sup> (2 395 <sup>(3)</sup> )	25.86 (3 751)	7.53 (1 092)	6.28 (910)	3.65 (530)	1.79 (260)	12 410 (1.80)	12 410 (1.80)
2 750F <sub>b</sub> - 1.8E	35.04 <sup>(2)</sup> (5 082 <sup>(2)</sup> )	33.13 (4 805)	16.51 <sup>(3)</sup> (2 395 <sup>(3)</sup> )	25.86 (3 751)	9.41 (1 365)	6.90 (1 001)	3.65 (530)	1.79 (260)	12 410 (1.80)	12 410 (1.80)
2 650F <sub>b</sub> - 1.9E	33.77 <sup>(2)</sup> (4 897 <sup>(2)</sup> )	33.13 (4 805)	16.51 <sup>(3)</sup> (2 395 <sup>(3)</sup> )	25.86 (3 751)	9.41 (1 365)	6.90 (1 001)	3.65 (530)	1.79 (260)	13 100 (1.90)	12 410 (1.80)
2 850F <sub>b</sub> - 2.0E	36.31 <sup>(2)</sup> (5 267 <sup>(2)</sup> )	36.31 (5 267)	18.58 <sup>(3)</sup> (2 694 <sup>(3)</sup> )	35.21 (5 107)	9.41 (1 365)	6.90 (1 001)	3.72 (540)	1.79 (260)	13 790 (2.00)	13 790 (2.00)
2 950F <sub>b</sub> - 2.0E	37.59 <sup>(2)</sup> (5 452 <sup>(2)</sup> )	37.59 (5 452)	18.58 <sup>(4)(3)</sup> (2 694 <sup>(3)</sup> )	35.21 (5 107)	9.41 (1 365)	6.90 (1 001)	3.72 (540)	1.79 (260)	13 790 (2.00)	13 790 (2.00)
3 100F <sub>b</sub> - 2.0E	39.50 <sup>(2)</sup> (5 729 <sup>(2)</sup> )	39.50 (5 729)	18.58 <sup>(3)</sup> (2 694 <sup>(3)</sup> )	35.21 (5 107)	9.41 (1 365)	6.90 (1 001)	3.72 (540)	1.79 (260)	13 790 (2.00)	13 790 (2.00)

**Notes to Table 1:**

- (1) The specified bending strength,  $F_b$ , is assigned for a standard depth of 305 mm (12 in.). For other depths, multiply  $F_b$  as follows:
  - For thicknesses < 32 mm (1 ¼ in.): multiply  $F_b$  by  $(305/\text{depth in mm})^{0.323}$  [(12/depth in in.)<sup>0.323</sup>]. For depths less than 89 mm (3 ½ in.), multiply  $F_b$  by 1.488.
  - For thicknesses ≥ 32 mm (1 ¼ in.): multiply  $F_b$  by  $(305/\text{depth in mm})^{0.261}$  [(12/depth in in.)<sup>0.261</sup>]. For depths less than 89 mm (3 ½ in.), multiply  $F_b$  by 1.379.
- (2) The specified bending strength,  $F_b$ , is assigned for a standard depth of 305 mm (12 in.). For depths greater than 305 mm (12 in.), multiply  $F_b$  by  $(305/\text{depth in mm})^{0.143}$  [(12/depth in in.)<sup>0.143</sup>]. For depths less than 305 mm (12 in.), multiply  $F_b$  by  $(305/\text{depth in mm})^{0.111}$  [(12/depth in in.)<sup>0.111</sup>]. For depths less than 89 mm (3 ½ in.), multiply  $F_b$  by 1.147.
- (3) The specified tension strength,  $F_t$ , is assigned for a standard length of 6 096 mm (20 ft.). For lengths other than 6 096 mm (20 ft.), multiply  $F_t$  by  $(6 096/\text{length in mm})^{0.111}$  [(20/length in ft.)<sup>0.111</sup>]. For lengths less than 914 mm (3 ft.), use the value adjusted for 914 mm (3 ft.).

- (4) Specified design stresses in Table 1 are for standard term load duration and shall be adjusted (with the exception of modulus of elasticity) using load duration factors as per CSA O86-01.
- (5) Specified design stresses in Table 1 shall apply to product installation conditions of use that are dry, well ventilated and covered. Dry conditions are product installation conditions where ambient moisture content is 15% or less.
- (6) All specified strengths are in accordance with CAN/CSA-O86-01.

**Table 4.1.2. Equivalent Specific Gravity for “LP® SolidStart® LVL” Fastener Design<sup>(1)(2)</sup>**

Grade	Equivalent Specific Gravity							
	Nails				Bolts Installed in Face <sup>(3)</sup>			
	Withdrawal Load		Lateral Load		Lateral Load 13 mm diam (1/2 in. diam)		Lateral Load 19 mm diam (3/4 in. diam)	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Load Applied // to Grain	Load Applied ⊥ to Grain	Load Applied // to Grain	Load Applied ⊥ to Grain
1400Fb-1.1E (cross-ply); 2000Fb-1.3E	0.42	0.48	0.49	0.50	0.43	0.45	0.39	0.50
1750Fb-1.3E (cross-ply); 2250Fb-1.5E & better	0.46	0.50	0.50	0.50	0.46	0.50	0.46	0.50

**Notes to Table 2:**

- (1) Fastener sizes and orientation not specifically described in Table 2 are beyond the scope of this Report. See CAN/CSA-O86-01, “Engineering Design in Wood,” Table A10.1, for equivalent species based on relative density (specific gravity).
- (2) Fastener values based on the equivalent specific gravities in Table 2 are for standard term load duration and may be adjusted using load duration factors as per the NBC 1995.
- (3) The bolt edge distance for 13-mm- (1/2 in.) and 19-mm- (3/4 in.) diameter bolts when loaded parallel and perpendicular to the grain shall be a minimum of four times the bolt diameter.
- (4) Equivalent specific gravities for fastener design for “LP® SolidStart® LVL” manufactured with Aspen and Yellow Poplar species veneers shall be as follows:

Veneer Species	Equivalent Specific Gravity							
	Nails				Bolts Installed in Face <sup>(3)</sup>			
	Withdrawal Load		Lateral Load		Lateral Load 13 mm diam (1/2 in. diam)		Lateral Load 19 mm diam (3/4 in. diam)	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Load Applied // to Grain	Load Applied ⊥ to Grain	Load Applied // to Grain	Load Applied ⊥ to Grain
Aspen	0.43	0.43	0.42	0.43	0.42	0.43	0.39	0.43
Yellow Poplar	0.46	0.46	0.50	0.50	0.42	0.55	0.42	0.55

**Table 4.1.3. Nail Spacing<sup>(1)(2)</sup> Requirements for “LP® SolidStart® LVL”**

Thickness mm (in.)	Orientation	Fastener	Closest On-Centre Spacing mm (in.)
< 38 (< 1-½)	Edge	64 mm & smaller (8d & smaller)	102 (4)
		76 mm & 83 mm (10d & 12d)	102 (4)
		89 mm (16d)	127 (5)
	Face <sup>(1)</sup>	64 mm & smaller (8d & smaller)	76 (3)
		76 mm & 83 mm (10d & 12d)	76 (3)
		89 mm (16d)	127 (5)
≥ 38 (≥ 1-½)	Edge	64 mm & smaller (8d & smaller)	76 (3)
		76 mm & 83 mm (10d & 12d)	102 (4)
		89 mm (16d)	127 (5)
	Face <sup>(1)</sup>	64 mm & smaller (8d & smaller)	76 (3)
		76 mm & 83 mm (10d & 12d)	76 (3)
		89 mm (16d)	127 (5)

**Notes to Table 4:**

- (1) The tabulated closest on-centre spacing for face orientation is applicable to nails that are installed in rows that are parallel to the direction of the grain (length) of the LVL. For nails that are installed in rows that are perpendicular to the direction of the grain (width/depth) of the LVL, the closest on-centre spacing for face orientation shall be as per CAN/CSA-O86-01, “Engineering Design in Wood.”
- (2) Fastener sizes and closest spacing not specifically described above are beyond the scope of this Report.
- (3) Fasteners are common wire or common spiral nails.

- (4) Edge distance shall be sufficient to prevent splitting but not less than permitted in CAN/CSA-O86-01, "Engineering Design in Wood."
- (5) Nail penetration for edge nailing shall not exceed 51 mm (2 in.) for 89-mm (16d 3½ in.) nails and 64 mm (2½ in.) for 76-mm (10d 3 in.) and 83-mm (12d 3¼ in.) nails.
- (6) For multiple rows of nails, the rows must be offset 13 mm (½ in.) or more from each other, and staggered.
- (7) For multiple rows of nails, rows must be equally spaced from the centerline of the product edge or face (whichever applies).

**Table 4.1.4. "LP® SolidStart® LVL" Factored Resistances for Rim Board<sup>(1)(2)(3)(6)</sup>**

Minimum Thickness, mm (in.)	Grade	Depth, mm (in.)	Vertical Load		Horizontal Lateral Load Transfer Capacity, <sup>(4)</sup> kN/m (lbs/ft.)	Lateral Resistance of 13 mm (1/2 in.) Lag Screw <sup>(5)</sup> (Installed in Face), kN (lbs)
			Uniform kN/m (lbs/ft.)	Concentrated kN (lbs)		
32 (1-1/4)	1400 Fb-1.1E (cross-ply)	≤ 406 (≤ 16)	195 (13 344)	31.2 (7 022)	4.76 (326)	3.34 (751)
		> 406 (> 16)	123 (8 457)	31.2 (7 022)	4.76 (326)	3.34 (751)
	1750Fb-1.3E (cross-ply)	≤ 406 (≤ 16)	204 (13 970)	31.2 (7 022)	4.76 (326)	3.34 (751)
		> 406 (> 16)	123 (8 457)	31.2 (7 022)	4.76 (326)	3.34 (751)
38 (1 ½)	2000Fb-1.3E and better	≤ 406 (≤ 16)	97 (6 650)	20.0 (4 500)	4.76 (326)	3.34 (751)
		> 406 (> 16)	60.6 (4 150)	20.0 (4 500)	4.76 (326)	3.34 (751)
44 (1 ¾)	2000Fb-1.3E and better	≤ 406 (≤ 16)	108 (7 400)	23.8 (5 350)	4.76 (326)	3.34 (751)
		> 406 (> 16)	83.9 (5 750)	23.8 (5 350)	4.76 (326)	3.34 (751)

**Notes to Table 3:**

- (1) The factored resistances are for the rim board only, under standard term and dry service loading; therefore, adjustment is permitted for other load durations in accordance with CAN/CSA-O86-01, "Engineering Design in Wood." The compressive resistance of the sill plate and the sheathing also needs to be checked in accordance with CAN/CSA-O86-01, "Engineering Design in Wood."
- (2) The horizontal lateral load transfer resistance is for shear forces parallel to the rim joist under short-term loading and dry service conditions only. The fastening of the floor shall meet or exceed Part 9 of the NBC 2005.
- (3) See Table 4 for minimum nail spacing requirements.
- (4) The nailing schedule for sheathing to rim is based on 51-mm (6d 2 in.) nails at 150 mm (6 in.) o.c., and rim board to sill plate (toe-nailed) is based on 64-mm (8d 2 ½ in.) nails at 150 mm (6 in.) o.c. Values assume floor joists or blocking fastened to the rim board and sill plate at 610 mm (24 in.) o.c. maximum as per Part 9 of the NBC 2005. Commercial framing connectors may be used to achieve lateral load capacities exceeding the values in this table.

Calculations shall be based on the equivalent specific gravity listed in Table 2 and shall not exceed the nail spacing requirements of Table 4.

- (5) Lag screw lateral resistance values are based on a 38-mm- (1 ½ in.) thick side member with full penetration of the lag screw.
- (6) For use with the limit states design procedures of the National Building Code of Canada 2005 and CAN/CSA-O86-01.

Report Holder: Louisiana-Pacific Corporation  
2706 Highway 421 North  
Wilmington, North Carolina  
USA 28401

Tel.: (910) 762-9878  
Fax: (910) 763-8178

Plants: Wilmington, North Carolina, USA

Golden, British Columbia, Canada

Murphy Plywood, Oregon, U.S.A.

*This Report is issued by the Canadian Construction Materials Centre, a program of the Institute for Research in Construction at the National Research Council of Canada. The Report must be read in the context of the entire CCMC Registry of Product Evaluations, including, without limitation, the introduction therein which sets out important information concerning the interpretation and use of CCMC Evaluation Reports.*

*Readers must confirm that the Report is current and has not been withdrawn or superseded by a later issue. Please refer to <http://irc.nrc.gc.ca/ccmc>, or contact the Canadian Construction Materials Centre, Institute for Research in Construction, National Research Council of Canada, 1200 Montreal Road, Ottawa, Ontario, K1A 0R6. Telephone (613) 993-6189. Fax (613) 952-0268.*

***NRC has evaluated the material, product, system or service described herein only for those characteristics stated herein. The information and opinions in this Report are directed to those who have the appropriate degree of experience to use and apply its contents. This Report is provided without representation, warranty, or guarantee of any kind, expressed, or implied, and the National Research Council of Canada (NRC) provides no endorsement for any evaluated material, product, system or service described herein. NRC accepts no responsibility whatsoever arising in any way from any and all use and reliance on the information contained in this Report. NRC is not undertaking to render professional or other services on behalf of any person or entity nor to perform any duty owed by any person or entity to another person or entity.***

## APPENDIX

The design values obtained from testing to ASTM D 5456-01, “Standard Specification for Evaluation of Structural Composite Lumber Products,” as specified in CAN/CSA-O86-01 are summarized below.

**Table A1. Additional Test Information for “LP® SolidStart® LVL”**

Property	Test Information
Bending	Specimens were tested in edgewise and flatwise bending to establish 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 in shear to establish 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 in compression parallel to grain to establish 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 perpendicular to grain	Specimens were tested in compression perpendicular to grain to establish the characteristic value. The characteristic value was multiplied by 1.09 to establish the specified strength in accordance with CAN/CSA-O86-01.
Tension parallel to grain	Specimens were tested in tension to establish 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, “Standard Test Methods for Mechanical Fasteners in Wood,” for a 6d common nail having a 31.75 mm (1¼ in.) penetration. Specimens were tested and equivalent species capacity was determined in accordance with Annex 2 of ASTM D 5456, “Standard Specification for Evaluation of Structural Composite Lumber Products
Nail bearing	Dowel bearing strength was determined in accordance with ASTM D 5764-95, “Standard Test Method for Evaluating Dowel-Bearing Strength of Wood and Wood-Base Products,” with 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 Annex 2 of ASTM D 5456 “Standard Specification for Evaluation of Structural Composite Lumber Products.”
Bolt bearing	Bolt bearing capacity was determined in accordance with ASTM D 5764-95, “Standard Test Method for Evaluating Dowel-Bearing Strength of Wood and Wood-Base Products,” with 13-mm (½ in.) and 19-mm (¾ in.) bolts. Specimens were tested and the mean bolt bearing capacity was used to establish the equivalent species capacity in accordance with Annex 2 of ASTM D 5456, “Standard Specification for Evaluation of Structural Composite Lumber Products.”
Creep	Twelve (12) specimens of “LP LVL” were tested in accordance with the CCMC Creep and Recovery Test, resulting in acceptable performance. Long-term (90-day) creep testing was also conducted. It demonstrated equivalency to duration of load behaviour of sawn lumber.
Adhesive	CSA O112.6-M1977, “Phenol and Phenol Resorcinol Resin Adhesives for Wood (High Temperature Curing).”