ICBO Evaluation Service, Inc.
5360 WORKMAN MILL ROAD • WHITTIER, CALIFORNIA 90601-2299
A subsidiary corporation of the International Conference of Building Officials
Accredited by the American National Standards Institute

EVALUATION REPORT

ER-5598*
Reissued September 1, 2000

Filing Category: DESIGN—Wood (038)

PACIFIC WOODTECH LAMINATED VENEER LUMBER (LVL)
PACIFIC WOODTECH CORPORATION
1850 PARK LANE
BURLINGTON, WASHINGTON 98233

GEORGIA-PACIFIC CORPORATION
4300 WILDWOOD PARKWAY
ATLANTA, GEORGIA 30339

1.0 SUBJECT

Pacific Woodtech and Georgia-Pacific G-P Lam® Laminated Veneer Lumber (LVL).

2.0 DESCRIPTION

2.1 General:

Pacific Woodtech laminated veneer lumber (LVL) is a structural composite lumber consisting of laminated Douglas fir veneers with grain parallel to the face of the member. An exterior-type phenol-formaldehyde adhesive, complying with the durability requirements of ASTM D 2559, is used in the manufacture of the LVL, to bond the veneers in a lay-up pattern specified in the approved quality control manual. Pacific Woodtech LVL is available in thicknesses from $^3/_4$ inch (19.1 mm) to $3^1/_2$ inches (89 mm), depths from $1^3/_4$ inches (44.5 mm) to 24 inches (610 mm), and lengths up to $66^1/_2$ feet (20 269 mm). Two grades of LVL are recognized in this evaluation report: 1.8E and 2.0E LVL.

Pacific Woodtech LVL may be trademarked G-P Lam® and distributed by Georgia-Pacific Corporation.

2.2 Design and Allowable Stresses:

The structural design provisions for wood construction noted in Chapter 23 of the code are applicable to Pacific Woodtech LVL, unless otherwise noted in this report. Allowable unit stresses for the two grades of LVL recognized in this report are noted in Table 1.

Unless otherwise noted, adjustment of the design stresses for duration of load is permitted in accordance with the code. Allowable stresses for the LVL are based on dry end-use conditions, such that the moisture content is less than or equal to 16 percent.

Where members qualify as repetitive members, as defined in Section 2304.3 of the code, an increase of four percent is permitted in allowable flexural stress.

Allowable lateral loads for nails or bolts installed perpendicular to the wide face of the LVL (face nailing) are the same as those provided in the code for solid-sawn lumber having a minimum specific gravity of 0.50. Allowable lateral nail values for nails installed parallel to the wide face of the LVL (edge nailing) are the same as those provided in the code for solid-sawn lumber having a minimum specific gravity of 0.47. Bolted connections made in the edge of the LVL are not permitted.

Allowable withdrawal loads for nails installed parallel or perpendicular to the wide face of the LVL are the same as those provided in the code for solid-sawn lumber having a minimum specific gravity of 0.50.

Spacing, edge distance, and end distance of nails installed perpendicular to the glue lines (the wide face of the LVL) are the same as those provided in Section 2318.3 of the code for solid-sawn lumber. Spacing of nails and staples installed parallel to the glue lines (the narrow face, or edge, of the LVL) is limited as follows:

PACIFIC WOODTECH LVL DIMENSIONS	FASTENER (installed parallel to glue lines on the narrow face of the material)	MINIMUM SPACING (inches)
Minimum $^3/_4$ inch thick and $3^1/_2$ inches deep	8d nail	3
	10d nail	4
	12d nail	4
	16d nail	Not permitted
	No. 14 gage staple	4
Minimum $1^1/_2$ inches thick and $3^1/_2$ inches deep	10d nail	4
	12d nail	4
	16d nail	8
	No. 14 gage staple	4

For **SI:** 1 inch = 25.4 mm.

Allowable loads for machine bolts installed perpendicular to the wide face of the LVL (perpendicular to the glue lines), with loads applied parallel or perpendicular to the grain of the wood veneers, are the same as those provided in the code for solid-sawn lumber having a minimum specific gravity of 0.50 (e.g., Douglas fir-larch).

Connections other than the nailed and bolted connections described in this report are outside the scope of this report.

2.3 Identification:

Pacific Woodtech LVL is identified by a stamp noting the product trade name or trademark; the grade; the evaluation report number (ICBO ES ER-5598); the name and logo of the quality control agency (APA EWS); and the manufacturer's APA mill number (1047).

3.0 EVIDENCE SUBMITTED

Data in compliance with the ICBO ES Acceptance Criteria for Structural Composite Lumber (AC47), dated March 2000; and a quality control manual.

***Corrected, January 2001**

4.0 FINDINGS

That the Pacific Woodtech Laminated Veneer Lumber (LVL) described in this report complies with the 1997 *Uniform Building Code*™, subject to the following conditions:

4.1 Design stresses comply with the values noted in this report.

4.2 Calculations must be furnished to the building official, verifying that the material is used in accordance with this report.

4.3 Pacific Woodtech LVL is limited to end-use locations at which the average equilibrium moisture content of the structural composite lumber is equal to or less than 16 percent.

4.4 Increases for duration of load, as provided for wood members and their connections, are permitted in accordance with the limitations specified in the code and as set forth in this report.

4.5 Where members qualify as repetitive members, as defined in Section 2304.3 of the code, an increase of four percent in allowable bending stresses is permitted.

4.6 Pacific Woodtech LVL is produced at the Pacific Woodtech Corporation manufacturing plant located in Burlington, Washington, with quality control inspections by APA–The Engineered Wood Association (AA-649).

This report is subject to re-examination in two years.

TABLE 1—ALLOWABLE DESIGN STRESSES FOR PACIFIC WOODTECH LVL

TYPE OF STRESSES	ALLOWABLE STRESS	
	1.8E LVL Grade	2.0E LVL Grade
Modulus of elasticity (MOE)	1,800,000 psi	2,000,000 psi
Edge wise flexural stress (F_b)[1,2,3,4]	2,750 psi	3,100 psi
Horizontal shear (joist, F_v)[4]	285 psi	285 psi
Compression perpendicular to grain (F_c per)	850 psi	850 psi
Compression parallel to grain (F_c par)	2,300 psi	2,750 psi
Tensile strength (F_t)[5]	1,950 psi	2,100 psi

For **SI:** 1 psi = 6.89 kPa, 1 inch = 25.4 mm.

[1]The tabulated flexural stress is based on a reference depth of 12 inches. For other depths, the tabulated flexural stress is adjusted by a size factor adjustment of $(12/d)1/5$, as shown below:

Depth (in.)	$3^1/_2$	$5^1/_2$	$9^1/_2$	$11^7/_8$	14	16	18	24
Multiply by	1.28	1.17	1.05	1.00	0.97	0.94	0.92	0.87

The maximum size factor permitted for depth effect shall be 1.47. The size factor derived in this footnote shall be cumulative with the duration-of-load adjustment factor and the repetitive-member adjustment factor stated in this report.

[2]The allowable stresses provided in Table 1 shall be based on covered dry conditions of use. Dry conditions of use shall be those environmental conditions represented by sawn lumber at which the equilibrium moisture content is less than 16 percent.

[3]The tabulated flexural stresses above are permitted to be increased by 4 percent for repetitive member stresses as provided in the *Uniform Building Code*™.

[4]The tabulated design stresses above are permitted to be adjusted for duration of load as provided in the *Uniform Building Code*.

[5]The tabulated tensile stress is based on a reference gage length (L) of 4 feet. For other gage length the tabulated tensile stress is adjusted by multiplying F_t by $(4/L)^{1/10}$ where L is measured in feet.

PACIFIC WOODTECH LAMINATED VENEER LUMBER (LVL)

PACIFIC WOODTECH CORPORATION
1850 PARK LANE
BURLINGTON, WASHINGTON 98233

CAPITAL LUMBER COMPANY
2111 EAST HIGHLAND AVENUE, SUITE 155
PHOENIX, ARIZONA 85016

FRANKLIN BUILDING SUPPLY COMPANY
11700 FRANKLIN ROAD
BOISE, IDAHO 83709

ROSEBURG FOREST PRODUCTS
4500 RIDDLE BY-PASS ROAD
RIDDLE, OREGON 97469

1.0 SUBJECT

Pacific Woodtech and Georgia-Pacific G-P Lam Laminated Veneer Lumber (LVL). Reissued September 1, 2000. (Supplement issue date: February 1, 2002.)

Supplement 1 covers the following revisions:

1. Revise the subject of the evaluation report: Pacific Woodtech, Capital Lumber Caplam, Franklin Building Supply FrankLam, Georgia-Pacific G-P Lam®, and Roseburg Forest Products RigidLam™ Laminated Veneer Lumber (LVL); and Pacific Woodtech $1^1/_4$-inch × 1.5E Rim Board.
2. Add listees: Capital Lumber Company, Franklin Building Supply Company, and Roseburg Forest Products.
3. Add provisions for 1.5E grade LVL.
4. Add 1.8E and 2.0E LVL allowable plank design properties to Table 1.
5. Add $1^1/_4$-inch × 1.5E Rim Board, including allowable design capacities shown in new Table 2.
6. Add new Table 3, providing equivalent specific gravity for LVL connection design.
7. Add new Table 4, providing revised LVL minimum edge fastener spacing.

2.0 DESCRIPTION

2.1 General:

Revise the first sentence as follows:

Pacific Woodtech Corporation (PWC) manufactures and private-labels laminated veneer lumber (LVL). Private labels include, but are not limited to, the companies shown as additional listees in this evaluation report.

Revise the last sentence as follows:

Three grades of LVL are recognized in this evaluation report: 1.5E, 1.8E, and 2.0E.

Add a second paragraph as follows:

Pacific Woodtech $1^1/_4$-inch × 1.5E Rim Board is $1^1/_4$ inches (31.7 mm) thick and a maximum of 16 inches (406 mm) deep, and is manufactured from 1.5E grade Pacific Woodtech LVL.

2.2 Design and Allowable Stresses: *Revise Section 2.2 as follows*:

The structural design provisions for wood construction provided in the 1997 *Uniform Building Code*™ (UBC) are applicable to the LVL unless it is noted otherwise in this report.

Allowable design properties for the LVL are provided in Table 1. Allowable design properties for $1^1/_4$-inch × 1.5E Rim Board are provided in Table 2. Unless otherwise noted, adjustment of the LVL design stresses for duration of load is permitted in accordance with the UBC. Allowable stresses for LVL and Rim Board apply to protected, dry service conditions, such as those environmental conditions that result in an equilibrium moisture content of less than 16 percent in sawn lumber. Where LVL members qualify as repetitive members, as defined in the UBC, an increase of 4 percent is permitted in allowable flexural stresses.

The allowable lateral load transfer capacity of $1^1/_4$-inch × 1.5E Rim Board used as the boundary element of horizontal diaphragms, transferring in-plane lateral loads from the diaphragm to the wall plate below, is 200 plf (2919 N/m). This lateral load transfer capacity is not permitted to be increased for duration of load. The Rim Board is permitted to be used in structures complying with conventional construction requirements as defined in Section 2320 of the UBC.

Allowable withdrawal and lateral loads for nails installed in the faces and the edges of LVL members are the same as those provided in the UBC for sawn lumber having a minimum specific gravity as shown in Table 3. Allowable lateral loads for bolts installed in the faces of LVL members, with loads applied parallel or perpendicular to the grain of the wood veneers, are the same as those provided in the UBC for sawn lumber having a minimum equivalent specific gravity as shown in the Table 3. Bolted connections made in the edges of LVL members are not permitted.

Spacing, edge distance and end distance of fasteners installed in the faces of LVL members (member faces showing the face of one veneer, typically the wide face of the member) are the same as those provided in the UBC for sawn lumber. Spacing of fasteners installed in the edges of LVL members (member faces showing the narrow edge of

all veneers, typically the narrow faces of the member) is limited as shown in Table 4.

Connections other than the nailed and bolted connections described in this report are outside the scope of this report.

Add a new Section 2.3 as follows:

2.3 Pacific Woodtech $1^1/_4$-inch x 1.5E Rim Board Applications:

Toenailed connections are not limited by the 150 plf (2189.1 N/m) lateral load capacity noted for Seismic Zones 3 and 4 in Section 2318.3.1 of the UBC.

Installation instructions or drawings for the Rim Board shall be available to the building official, at the jobsite, upon request. The instructions shall include any special instructions required for the product, such as nailing at edges, as well as weather protection and handling requirements. In cases where attachment requirements, lateral support details and bearing or connection requirements are not adequately covered by the installation instructions, standard sketches shall be included in the approved building plans.

Renumber and revise Section 2.3 as follows:

2.4 Identification:

The Pacific Woodtech LVL is identified by a stamp noting the product trade name or trademark, LVL grade, production date, evaluation report number (ICBO ES ER-5598), the name or logo of the quality control agency (APA EWS), the manufacturer (PWC), and the manufacturer's APA mill number (1047).

Pacific Woodtech $1^1/_4$-inch × 1.5E Rim Board is identified by a stamp noting the product trade name or trademark, the grade (1.5E), the thickness ($1^1/_4$-inch), the production date, the evaluation report number (ICBO ES ER-5598), the name or logo of the quality control agency (APA EWS), the manufacturer (PWC), and the manufacturer's APA mill number (1047).

Revise Section 3.0 as follows:

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICBO ES Acceptance Criteria for Structural Composite Lumber (AC47), dated March 2000, and with the Acceptance Criteria for Wood-based Rim Board Products (AC124), dated July 2000; and a quality control manual.

4.0 FINDINGS

That the Pacific Woodtech Laminated Veneer Lumber (LVL) described in this report complies with the 1997 *Uniform Building Code*™, subject to the following conditions:

4.1 through 4.6: No change.

Unless specifically noted in this evaluation report supplement, the master report remains valid and unchanged.

This supplemental report expires concurrently with the master report dated December 1, 2000.

TABLE 1—ALLOWABLE DESIGN PROPERTIES FOR PACIFIC WOODTECH LVL (psi)[1]

DESIGN PROPERTY		1.5E GRADE	1.8E GRADE	2.0E GRADE
Flexural stress, F_b[5,6]	beam [2,4]	2250	2750	3100
	plank [3]	2250	2750	3100
Modulus of elasticity, E	beam [2]	1,500,000	1,800,000	2,000,000
	plank [3]	1,500,000	1,800,000	2,000,000
Horizontal shear, F_v[6]	beam [2]	220	285	285
	plank [3]	150	150	150
Compression perpendicular to grain, $F_C z$	beam[2]	575	850	850
	plank [3]	435	450	450
Tension parallel to grain, F_t[6,7]		1500	1950	2100
Compression parallel to grain, F_c[6]		1950	2300	2750

For **SI:** 1 psi = 6.89 kPa, 1 inch = 25.4 mm.

[1]The tabulated design properties apply to protected, dry service conditions.
[2]Beam values apply to members loaded and supported on faces showing the narrow edge of all veneers, typically the narrow faces of the member.
[3]Plank values apply to members loaded and supported on faces showing the face of one veneer, typically the wide faces of the member.
[4]The tabulated flexural stress for beam orientation is based on a reference depth of 12 inches. For other depths (d inches), the tabulated flexural stress for beam orientation shall be adjusted by multiplying by a size factor of $(12/d)^{1/8}$ for 1.5E grade, or $(12/d)^{1/5}$ for 1.8E and 2.0E grades, as shown below:

DEPTH (inches)		$1^3/_4$	$3^1/_2$	$5^1/_2$	$9^1/_2$	$11^7/_8$	14	16	18	24
Multiply by	1.5E	1.27	1.17	1.10	1.03	1.00	0.98	0.96	0.95	0.92
	1.8E & 2.0E	1.47	1.28	1.17	1.05	1.00	0.97	0.94	0.92	0.87

Use the factor for $1^3/_4$ inches for shallower depths. The size factor shall be cumulative with duration-of-load and repetitive-member adjustment factors.

[5]The tabulated flexural stresses are permitted to be increased by 4 percent for repetitive members as provided in the code.
[6]The tabulated design stresses are permitted to be adjusted for duration of load as provided in the code for solid sawn lumber.
[7]The tabulated tension parallel to grain stress is based on a reference gage length of 4 feet. For other lengths (L feet), the tabulated tension parallel to grain stress shall be adjusted by multiplying by a factor of $(4/L)^{1/8}$ for 1.5E grade, or $(4/L)^{1/10}$ for 1.8E and 2.0E grades.

TABLE 2—$1^1/_4$-INCH × 1.5E RIM BOARD DESIGN PROPERTIES[1,2,3]

PARAMETER	VALUE
Lateral load transfer capacity[4]	200 plf[5]
Vertical load transfer capacity	3450 plf
$^1/_2$ diameter lag screw or bolt lateral load capacity	350 lbs

For **SI:** 1 inch = 25.4 mm, 1 plf = 14.59 N/m.

[1]The tabulated design properties apply to protected, dry service conditions.
[2]The tabulated design properties may be adjusted for duration of load, as provided in the code, except where noted.
[3]Other design properties are as provided for 1.5E grade Pacific Woodtech LVL in Table 1 of this report.
[4]The tabulated lateral load transfer capacity applies to a ten-minute wind or earthquake load duration (C_D = 1.33). No increase is permitted for duration of load.
[5]$1^1/_4$-inch × 1.5E Rim Board may be substituted for solid-sawn framing in horizontal wood diaphragms as shown in Table 23-II-H of the UBC, provided the maximum shear values for the diaphragms are limited to the allowable lateral load capacity noted in this table.

TABLE 3—EQUIVALENT SPECIFIC GRAVITY FOR CONNECTION DESIGN

PW LVL GRADE	1.5E		1.8E AND 2.0E	
Connection type	Face	Edge	Face	Edge
Nail—withdrawal	0.42	0.42	0.50	0.50
Nail—lateral	0.42	0.39	0.50	0.47
Bolt—lateral	0.42	NA	0.50	NA

Face: Member faces showing the face of one veneer, typically the wide faces of the member.
Edge: Member faces showing the narrow edge of all veneers, typically the narrow faces of the member.

TABLE 4—MINIMUM EDGE FASTENER SPACING

LVL DIMENSIONS	FASTENER[1]	MINIMUM SPACING (inches)
Minimum $^3/_4$ inch thick and $3^1/_2$ inches deep	8d nail	3
	10d nail	4
	12d nail	4
	16d nail	Not permitted
	14 gage staple	4
Minimum $1^1/_4$ inches thick and $3^1/_2$ inches deep	10d nail	4
	12d nail	4
	16d nail	6[2]
	14 gage staple	4

For **SI:** 1 inch = 25.4 mm.

[1]Nails are either common or box nails.
[2]May be 4 inches when nailing through bottom wall plate and sheathing (maximum $1^3/_8$ inches penetration).