

CSI: DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 17 00—Shop-Fabricated Structural Wood

Product Certification System:

The ICC-ES product-certification system includes evaluating reports of tests of standard manufactured product, prepared by accredited testing laboratories and provided by the listee, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the listee's quality system.

Product: LAMCO-LFL® GRADES 1.6E, 1.7E, 1.9E and 2.1E

Listee: PRODUITS FORESTIERS LAMCO INC.

Compliance with the following standards:

- ASTM D5456 (-14b and -07), Standard Specification for Evaluation of Structural Composite Lumber Products, ASTM International.
- Annex A7 – Test Setup and Data Analysis Procedure for Determining Horizontal Shear Stress by Full Scale Beam Tests – ASTM D3737 (-12 and -07), Standard Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam), ASTM International.

Compliance with the following building code:

LAMCO-LFL® Grades 1.6E, 1.7E, 1.9E and 2.1E products, as described in this listing report, have met the testing requirements (Bending, Tension, Compression Perpendicular to Grain, Compression Parallel to Grain, Modulus of Elasticity and Modulus of Elasticity for Beam and Column Stability) in ASTM D5456 and Annex A7 (Longitudinal Shear Strength) of ASTM D3737. The materials were evaluated, when tested in accordance with ASTM D5456 and Annex A7 of ASTM D3737, and analyzed to derive corresponding reference Limit States Design (LSD) values detailed in Table 1 to meet the requirements noted in Clauses 15.3 and 16.3 of CSA O86-14 and Clauses 13.3 and 14.3 of CSA O86-09, which are referenced in the applicable sections of the following code edition:

- *National Building Code of Canada® 2015*
Applicable Section: Volume 1- Division B: 4.3.1.1.(1)
- *National Building Code of Canada® 2010*
Applicable Section: Volume 2- Division B: 4.3.1.1.(1)
- *Quebec Building Code – Building Act 2020*
Applicable Sections: Chapter B-1.1 – Chapter II: Building Work, Division I-Application: Article 12; Chapter B-1.1 – Chapter II: Building Work, Division II-Building Code: Articles 13 through 23; and Chapter B-1.1, r.2 – Construction Code-Chapter 1: Building, Division I, Article 1.0.1. [*National Building Code of Canada® 2010* Division B: 4.3.1.1.(1)].
- *Ontario Building Code 2012. Building Code Act, 1992*
Applicable Section: O. Reg. 332/12, Division B: 4.3.1.1.(1)
- *Alberta Building Code 2019*
Applicable Section: Volume 1- Division B: 4.3.1.1.(1)
- *British Columbia Building Code 2018*
Applicable Section: Division B: 4.3.1.1.(1)

Description of product:

- LAMCO-LFL® Grades, as described in this listing report and as shown in Figure 1, are used as alternatives to sawn lumber for floor, wall and roof structural members. These structural applications include use as beams, headers, joists, rafters, columns, plates, truss chords and truss webs. The products are also used as components for built-up members.
- The wood properties, species, adhesive, manufacturing parameters and finished product thickness, width (depth) and length meet the requirements noted in the quality documentation that contains the manufacturing standard. LAMCO-LFL® Grades are available in thicknesses between 1⁷/₁₆ inches (36.5 mm) and 1½ inches (38.1 mm), widths (depths) of 2½ (63.5 mm) to 16 inches (356 mm), and lengths up to 32 feet 1 inch (9780 mm). The grades and corresponding reference Limit States Design (LSD) values for LAMCO-LFL® are given in Table 1. Equivalent specific gravities for connection design with LAMCO-LFL® Grades are given in Table 2.
- LAMCO-LFL® Grades are comprised of short segments of visually graded or MSR black spruce and jack pine lumber, glued edgewise with compound tongue and groove horizontal joints and glued lengthwise with vertical finger joints. Phenol-resorcinol-formaldehyde or polyurethane adhesives are used for both edge and finger joints, in accordance with the approved quality documentation. All adhesives are HRA (Heat Resistant Adhesive) and qualified in accordance with Section 4.3 (Adhesives) of ASTM D5456-14b and Section 4.2 (Adhesives) of ASTM D5456-07 and approved quality documentation [CSA O112.6, CSA O112.7, CSA O112.9 and CSA O112.10 as referenced in CSA O86 (-14 and -09)].

Design Requirements:

LAMCO-LFL® Grades are designed as solid-sawn lumber in accordance with the applicable code, CSA O86-14, and the ANSI/AWC/AF&PA *National Design Specification® for Wood Construction* (NDS) except as modified in this report. The referenced Limit States Design (LSD) values for LAMCO-LFL® grades are given in Table 1 and are for normal load duration. The design value adjustment factors shall be applied as noted in Clauses 15.3 and 16.3 of CSA O86-14 and Clauses 13.3 and 14.3 of CSA O86-09; Section 4.3.1 of the NDS and Tables 4A (1.6E only) and 4C (1.7E, 1.9E, and 2.1E) of the NDS *Supplement, Design Values for Wood Construction* (NDS Supplement); and Table 1 of this report.

Identification:

1. The LAMCO-LFL® Grades 1.6E, 1.7E, 1.9E and 2.1E are identified with stamps noting the product and company (LAMCO), respectively, plant number (#628), the grade designation, the name of the third-party inspection agency (PFS), the date of manufacture, the ICC-ES listing report number (ESL-1232), and the ICC-ES listing mark, as applicable.

2. The report holder's contact information is the following:

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Installation: The LAMCO-LFL® Grades 1.6E, 1.7E, 1.9E and 2.1E must be installed in accordance with this report, the manufacturer's published installation instructions, the ANSI/AWC/AF&PA *National Design Specification® for Wood Construction* (NDS), the applicable code, and standard framing practice as applied to solid-sawn lumber.

Connections: Allowable lateral and withdrawal load values for nails installed in the wide face or the edge of the members are as provided in the ANSI/AWC/AF&PA *National Design Specification® for Wood Construction* (NDS) for sawn lumber with a specific gravity of as shown in Table 2. Allowable lateral load values for bolts installed in the edge of the members and loaded parallel to grain and allowable lateral load values for bolts installed in the wide face of the members and loaded either parallel or perpendicular to grain are as provided in the NDS for sawn lumber with a specific gravity as shown in Table 2. Edge distance, end distance and fastener spacing must be in accordance with Chapter 12 of the 2015 NDS (Chapter 11 of the 2012 and 2005 NDS, respectively).

Conditions of Listing:

1. The listing report addresses only conformance with the standards and code sections noted above.
2. Approval of the product's use is the sole responsibility of the local code official.
3. The listing report applies only to LAMCO-LFL® Grades 1.6E, 1.7E, 1.9E and 2.1E tested and analyzed as submitted for review by ICC-ES.

4. The design value adjustment factors shall be applied as noted in Clauses 15.3 and 16.3 of CSA O86-14 and Clauses 13.3 and 14.3 of CSA O86-09; Section 4.3.1 of the NDS and Tables 4A (1.6E only) and 4C (1.7E, 1.9E and 2.1E) of the NDS *Supplement, Design Values for Wood Construction* (NDS Supplement); and Table 1 of this report.
5. The material is limited to use in dry areas in which its moisture content will not exceed 16 percent.
6. Use of the material, as rim board or in fire-resistive applications, is outside the scope of this report.
7. The use of fire-retardant or preservative treatments with LAMCO-LFL® Grades is outside the scope of this report.
8. Design calculations and details for specific applications must be furnished to the code official to verify compliance with this listing report and the applicable code. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
9. LAMCO-LFL® Grades 1.6E, 1.7E, 1.9E and 2.1E are produced at the Produits Forestiers LAMCO Inc. manufacturing plant located in Saint Felicien, Quebec, Canada, with quality control inspections by ICC-ES and PFS Corporation (AA-652).

TABLE 1—LAMCO-LFL® REFERENCE DESIGN VALUES (LSD)^{4,5,6}

PROPERTY	GRADE			
	1.6E	1.7E	1.9E	2.1E
Bending (F_b) (MPa)	14.3 ⁽¹⁾	22.7 ⁽¹⁾	29.3 ⁽¹⁾	29.3 ⁽¹⁾
Tension (F_t) (MPa)	16.4 ⁽²⁾	20.2 ⁽²⁾	23.0 ⁽²⁾	27.7 ⁽²⁾
Longitudinal Shear (F_v) (MPa)	1.7	2.3	2.6	3.2
Compression Perpendicular to Grain ($F_{c\perp}$) (MPa)	5.33	7.46	8.47	8.47
Compression Parallel to Grain (F_c) (MPa)	17.6	21.2	24.1	29.3
Modulus of Elasticity ⁽³⁾ (E) (MPa)	10,859	11,802	13,257	14,227
Modulus of Elasticity for Beam and Column Stability (E_{min}) (MPa)	8,998	9,778	10,984	11,788

For SI: 0.006895 MPa = 1 psi

¹The tabulated F_b value for the 1.6E grade is based on a reference depth of 12 inches (305 mm). For depths other than 12 inches (305 mm), multiply F_b by a size factor adjustment of $(12/d)^{0.34}$, where d is the depth in inches (1 inch = 25.4 mm).

Tabulated F_b values for the 1.7E, 1.9E, and 2.1E grades are based on a reference depth of 12 inches (305 mm). For depths other than 12 inches (305 mm), multiply F_b by a size factor adjustment of $(12/d)^{0.25}$, where d is the depth in inches (1 inch = 25.4 mm).

Maximum values for F_b multiplied by the size factor adjustment must not exceed 18.7 MPa for 1.6E, 27.3 MPa for 1.7E, 31.3 MPa for 1.9E, and 35.6 MPa for 2.1E grades.

²The tabulated F_t value for the 1.6E grade is based on a reference length of 24 inches (610 mm). Multiply F_t by a size factor adjustment of $(24/L)^{0.15}$, where L is the length in inches (1 inch = 25.4 mm).

Tabulated F_t values for the 1.7E and 1.9E grades are based on a reference length of 88 inches (7 feet – 4 inches) (2235 mm). For lengths greater than 88 inches (2235 mm), multiply F_t by a size factor adjustment of $(88/L)^{0.1335}$, where L is the length in inches (1 inch = 25.4 mm).

Tabulated F_t value for the 2.1E grade is based on a reference length of 88 inches (7 feet – 4 inches) (2235 mm). For lengths greater than 88 inches (2235 mm), multiply F_t by a size factor adjustment of $(88/L)^{0.125}$, where L is the length in inches (1 inch = 25.4 mm).

³The tabulated reference modulus of elasticity values are the shear-free modulus of elasticity. Calculated deflections of flexural members must account for combined bending and shear deflection when using shear-free modulus of elasticity. For example, the deflection of a uniformly loaded single span beam is calculated as follows:

$$\Delta = \frac{5 WL^4}{32 E b h^3} + \frac{12 WL^2}{5 E b h}$$

where

Δ = deflection in inches (mm)
 W = uniformly distributed load in pounds/inch (N/mm)
 L = span in inches (mm)
 E = shear-free modulus of elasticity in psi (MPa)
 b = width of beam in inches (mm), and
 h = depth of beam in inches (mm).

⁴The referenced design values in this table are to be used in accordance with CSA O86 (-14 and -09).

⁵The referenced design values in this table are limited to conditions in which the average moisture content of sawn lumber is less than or equal to 16%.

⁶A 4% increase is permitted to F_b when structural members qualify as a load-sharing system in accordance with Clause 15.3.2.4 of CSA O86-14 and Clause 13.3.2.4 of CSA O86-09.

TABLE 2—LAMCO-LFL[®] EQUIVALENT SPECIFIC GRAVITY (ESG) FOR CONNECTION DESIGN^{1,2}

Grade	1.6E	1.7E	1.9E	2.1E
Equivalent Specific Gravity (ESG)	0.42	0.42	0.46	0.50

¹Duration-of-load adjustments to fastener values determined using the equivalent specific gravities in this table shall be applied in accordance with CSA O86 (-14 and -09).

²When the load component is acting parallel to grain or perpendicular to grain, the placement of fasteners in connections must be in accordance with Clause 12.4.3 of CSA O86-14 and Clause 10.4.3 of CSA O86-09.

FIGURE 1—LAMCO-LFL[®]