

ICC-ES Evaluation Report

ESR-4781

Reissued April 2025

This report also contains:

- City of LA Supplement
- CA Supplement

Subject to renewal February 2027

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DIVISION: 06 00 00— WOOD, PLASTICS AND COMPOSITES Section: 06 17 15— Laminated Veneer Bamboo Section: 06 17 25— Laminated Strand Lumber	REPORT HOLDER: HANGZHOU ZHUNANMU ENVIRONMENTAL PROTECTION TECHNOLOGY CO., LTD.	EVALUATION SUBJECT: LAMINATED BAMBOO STRAND LUMBER	
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1.0 EVALUATION SCOPE

1.1 Compliance with the following codes:

- 2021 and 2018 [International Building Code® \(IBC\)](#)
- 2021 and 2018 [International Residential Code® \(IRC\)](#)

Property evaluated:

- Structural

1.2 Evaluation to the following green code(s) and/or standards:

- 2022 [California Green Building Standards Code \(CALGreen\)](#), Title 24, Part 11
- 2020, 2015, 2012 and 2008 ICC 700 [National Green Building Standard™](#) (ICC 700-2020, ICC 700-2015, ICC 700-2012, and ICC 700-2008)

Attributes verified:

See Section 3.1

2.0 USES

The Laminated Bamboo Strand Lumber (LBSL) described in this report is used as alternative to sawn lumber and is intended for structural applications such as beams, headers, joists, and rafters in the conventional light-frame wood construction in accordance with Section 2308 of the IBC. The LBSL may also be used as components of built-up structural members, such as beams and columns. The LBSL may be used in structures regulated under the IRC when an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 General:

The LBSL is a structural composite lumber and has been evaluated by testing in accordance with the performance requirements outlined in ASTM D5456 for the laminated strand lumber and laminated veneer bamboo. The LBSL is manufactured with the bamboo strands oriented with the grain parallel to the length

of the billet. The strands are glued together using an exterior-type structural adhesive, complying with ASTM D5456. The dimensions, species and properties of the bamboo strands, and the adhesives, manufacturing parameters, finished product dimensions and tolerances are as specified in the manufacturer's approved quality documentation. The LBSL is available in one grade with nominal thicknesses from 0.787 inches (20 mm actual) to 1.97 inches (50 mm actual), width up to 48 inches (1220 mm actual) and lengths up to 96 feet (2440 mm actual).

The attributes of the structural lumber have been verified as conforming to the provisions of (i) CALGreen Section A4.404.3 for efficient framing techniques; (ii) ICC 700-2020 Sections 608.1(2), 11.608.1(2) and 13.104.3.1(4); (iii) ICC 700-2015 and ICC 700-2012 Sections 608.1(2), 11.608.1(2) and 12(A).608.1(b) for resource-efficient materials; and (iv) ICC 700-2008 Section 607.1(2) for resource-efficient materials. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: The design provisions for structural composite lumber in the ANSI/AWC *National Design Specification*[®] (NDS) for Wood Construction with Commentary, as referenced in the applicable code, are applicable to the LBSL, except where noted otherwise in this report. The allowable stress design values provided in [Table 1](#) are for normal load duration and covered dry conditions of use as described in Section 5.4 of this report. The allowable stress design values in [Table 1](#) are to be adjusted for other duration of loads and applicable adjustment factors in accordance with the NDS. Where members are qualified as repetitive members, the allowable flexural stress for members use in the beam orientation is permitted to be increased 4 percent.

4.1.2 Connections: The design of mechanical connections in the LBSL must be in accordance with the NDS. Equivalent specific gravities for the design of nail and bolt connections under dry use conditions are given in [Table 2](#). Bolt connections are not allowed in member edges. Connections, other than nailed and bolted connections described in this report, are outside the scope of this report.

The minimum nail spacing for nails installed into the edge of the LBSL must be 4 inches (101.6 mm) for 12d common and 5 inches (127 mm) for 16d common nails. The minimum nail spacing for nails installed into the face of the LBSL must be 3 inches (76.2 mm) for 12d common and 5 inches (127 mm) for 16d common nails.

The minimum end distances for nails installed into the edge of the LBSL must be 3½ inches (88.9 mm) for 12d and 16d common nails. The minimum end distances for nails installed into the face of the LBSL must be 1½ inches (38.1 mm) for 12d and 16d common nails.

The minimum edge distance must be sufficient to prevent splitting of the LBSL. The maximum nail penetration into the LBSL must be limited as necessary to prevent splitting.

4.2 Installation:

The Laminated Bamboo Strand Lumber described in this report must be installed in accordance with the applicable code, this report, and the manufacturer's published installation instructions. The manufacturer's published installation instructions must be available at the jobsite at all times during installation.

5.0 CONDITIONS OF USE:

The Laminated Bamboo Strand Lumber described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** Fabrication, design, installation, and connection restrictions must comply with this report and the manufacturer's published installation instructions. In the event of a conflict between the manufacturer's published installation instructions and this report, this report governs.
- 5.2** The design stresses must not exceed those set forth in this report and must be adjusted with the applicable load duration factor specified by the IBC and IRC, as applicable.
- 5.3** Design calculations and details for specific applications must be furnished to the code official verifying compliance with this report and the IBC and IRC, as applicable. The individual preparing such 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.

- 5.4 Use of the Laminated Bamboo Strand Lumber must be limited to dry, interior conditions. Dry conditions of use are those conditions of use represented by sawn lumber at which the service average moisture content of sawn lumber is less than 16 percent.
- 5.5 Designs of built-up beams and columns using the Laminated Bamboo Strand Lumber are outside scope of this report.
- 5.6 Cutting and notching of the Laminated Bamboo Strand Lumber are outside the scope of this report.
- 5.7 The Laminated Bamboo Strand Lumber having fire-retardant or preservative chemical treatments are outside the scope of this report.
- 5.8 The Laminated Bamboo Strand Lumber is manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the [ICC-ES Acceptance Criteria for Structural Wood-based Products \(AC47\)](#), dated June 2017 (editorially revised February 2021).

7.0 IDENTIFICATION

- 7.1 Product labeling shall include, the name of the report holder or listee, and the ICC-ES mark of conformity. The listing or evaluation report number (ICC-ES ESR-4781) may be used in lieu of the mark of conformity. Each Laminated Bamboo Strand Lumber must bear a stamp indicating the report holder name (Hangzhou Zhunanmu Environmental Protection Technology Co., Ltd.) and address, the product name and grade, and the evaluation report number (ESR-4781), or the ICC-ES mark of conformity.
- 7.2 The report holder's contact information is the following:

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TABLE 1—ALLOWABLE STRESS DESIGN VALUES FOR 1.7E LAMINATED BAMBOO STRAND LUMBER^{1,2}

BENDING (BEAM) $F_b^{3,4}$ (psi)	BENDING (PLANK) F_b (psi)	TENSION PARALLEL TO GRAIN F_t^5 (psi)	COMPRESSION PARALLEL TO GRAIN F_c (psi)	COMPRESSION PERPENDICULAR TO GRAIN F_{cL}^6 (psi)		HORIZONTAL SHEAR F_v (psi)		MODULUS OF ELASTICITY ⁷ ($\times 10^6$ psi)	
				Orientation		Orientation		Orientation	
				Beam	Plank	Beam	Plank	Beam	Plank
3,200	3,500	2,300	2,600	760	800	400	400	1.70	1.75

For SI: 1 inch = 25.4 mm, 1 psi = 6894.8 Pa

¹The tabulated allowable stress design values are for normal load duration and must be adjusted by the applicable adjustment factors in accordance with the 2018 *National Design Specification[®] for Wood Construction* (NDS). Modulus of elasticity and compression perpendicular-to-grain must not be adjusted for duration of load.

²The tabulated allowable stress design values are for dry and interior applications. See Section 5.4 of this report.

³The tabulated bending design value is assigned for a standard depth of 12 inches. For other depths greater than 3 1/2 inches, multiply F_b by a depth factor of $(12/d)^{0.25}$, where d is the depth of the member in inches. For depths 3 1/2 inches or less, multiply F_b by 1.36.

⁴Where a member qualifies as a repetitive member, the tabulated bending design value may be increased by 4 percent, in accordance with Section 8.3.7 of the 2018 NDS.

⁵The tabulated tension design value is based on a standard length of 3 feet. For lengths longer than 3 feet, multiply F_t by $(3/L)^{0.125}$, where L is the length in feet. For lengths less than 4 feet, use the tabulated tension design value given in the table above.

⁶The NDS bearing area factor, C_b , is permitted to be applied to the tabulated compression perpendicular-to-grain design values, F_{cL} .

⁷The apparent modulus of elasticity.

TABLE 2—EQUIVALENT SPECIFIC GRAVITY FOR FASTENER DESIGN^{1,2,3,4}

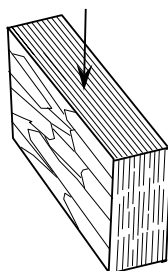
GRADE	EQUIVALENT SPECIFIC GRAVITY					
	Nails				Bolts	
	Withdrawal		Dowel Bearing		Dowel Bearing (Installed in Face)	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Load Applied Parallel to Grain	Load Applied Perpendicular to Grain
1.7E	0.43	0.52	0.65	0.65	0.60	0.60

¹Fastener lateral and withdrawal design values calculated using the tabulated equivalent specific gravities given in table above for nails and bolts connections must be adjusted by the applicable adjustment factors specified in the 2018 NDS.

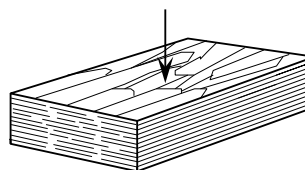
²Equivalent specific gravity values apply only to bolts installed into the face of the Laminated Bamboo Strand Lumber, such that the bolt axis is perpendicular to the wide faces of the strands.

³Minimum nail spacing and end distance must be as specified in Section 4.1 of this report.

⁴Minimum spacing, end and edge distance for bolts must be as specified in the 2018 NDS.



Beam Orientation



Plank Orientation

FIGURE 1—ILLUSTRATION OF BEAM AND PLANK ORIENTATION AS NOTED IN TABLE 1

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 17 15—Laminated Veneer Bamboo

Section: 06 17 25—Laminated Strand Lumber

REPORT HOLDER:

HANGZHOU ZHUNANMU ENVIRONMENTAL PROTECTION TECHNOLOGY CO., LTD.

EVALUATION SUBJECT:

LAMINATED BAMBOO STRAND LUMBER

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Laminated Bamboo Strand Lumber, described in ICC-ES evaluation report [ESR-4781](#), has also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 City of Los Angeles Building Code ([LABC](#))
- 2020 City of Los Angeles Residential Code ([LARC](#))

2.0 CONCLUSIONS

The Laminated Bamboo Strand Lumber, described in Sections 2.0 through 7.0 of the evaluation report [ESR-4781](#), complies with the LABC Chapter 23, and the LARC, and is subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Laminated Bamboo Strand Lumber, described in this evaluation report supplement, must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-4781](#).
- The design, installation, conditions of use and identification are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-4781](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This evaluation report supplement expires concurrently with the evaluation report [ESR-4781](#), reissued April 2025.

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Section: 06 17 15—Laminated Veneer Bamboo

Section: 06 17 25—Laminated Strand Lumber

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EVALUATION SUBJECT:

LAMINATED BAMBOO STRAND LUMBER

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Laminated Bamboo Strand Lumber, described in ICC-ES evaluation report ESR-4781, has also been evaluated for compliance with the codes noted below.

Applicable code edition(s):

- 2019 *California Building Code* (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2019 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Laminated Bamboo Strand Lumber, described in Sections 2.0 through 7.0 of the evaluation report ESR-4781, complies with CBC Chapters 23, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions, noted in the evaluation report ESR-4781 and the additional requirements of CBC Chapter 16 and 17, as applicable.

2.1.1 OSHPD: The applicable OSHPD Sections of the CBC are beyond the scope of this supplement.

2.1.2 DSA: The applicable DSA Sections of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Laminated Bamboo Strand Lumber, described in Sections 2.0 through 7.0 of the evaluation report ESR-4781, complies with CRC Chapters 5 and 8, provided the design and installation are in accordance with the 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report ESR-4781.

This evaluation report supplement expires concurrently with the evaluation report ESR-4781, reissued April 2025.