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Standard Specification for Evaluation of Structural Composite Lumber Products¹

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INTRODUCTION

Structural composite lumber is intended for use as an engineering material for a variety of end-use applications. The composition of the lumber varies by wood species, adhesive composition, wood element size, shape, and arrangement. To provide the intended performance, composite lumber products require: (1) an evaluation of the mechanical and physical properties and their response to end-use environments, and (2) establishment of and conformance to standard performance specifications for quality.

Procedures contained in this specification are also to be used for establishing the design properties and for checking the effectiveness of property assignment and quality assurance procedures.

The quality assurance sections in this specification are intended to serve as a basis for designing quality-control programs specific to each product. The objective is to ensure that design values established in the qualification process are maintained.

This specification is arranged as follows:

	Section
Qualification	6
Determination of Allowable Design Stresses	7
Independent Inspection	8
Quality Assurance	10

1. Scope

1.1 This specification recognizes the complexity of structural glued products. Consequently, this specification covers both specific procedures and statements of intent that sampling and analysis must relate to the specific product.

1.2 This specification was developed in the light of currently manufactured products as defined in 3.2. Materials that do not conform to the definitions are beyond the scope of this specification. A brief discussion is found in Appendix X2.

1.3 Details of manufacturing procedures are beyond the scope of this specification.

NOTE 1—There is some potential for manufacturing variables to affect the properties of members that are loaded for sustained periods of time. Users of this specification are advised to consider the commentary on this topic in Appendix X2.

¹ This specification is under the jurisdiction of ASTM Committee D07 on Wood and is the direct responsibility of Subcommittee D07.02 on Lumber and Engineered Wood Products.

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1.4 This specification primarily considers end use in dry service conditions, such as with most protected framing members, where the average equilibrium moisture content for solid-sawn lumber is less than 16 %. The conditioning environment of 6.3 is considered representative of such uses.

1.5 The performance of structural composite lumber is affected by wood species, wood element size and shape, and adhesive and production parameters. Therefore, products produced by each individual manufacturer shall be evaluated to determine their product properties, regardless of the similarity in characteristics to products produced by other manufacturers. Where a manufacturer produces product in more than one facility, each production facility shall be evaluated independently. For additional production facilities, any revisions to the full qualification program in accordance with this specification shall be approved by the independent qualifying agency.

1.6 This specification is intended to provide manufacturers, regulatory agencies, and end users with a means to evaluate a composite lumber product intended for use as a structural material.

1.7 This specification covers initial qualification sampling, mechanical and physical tests, analysis, and design value

assignments. Requirements for a quality-control program and cumulative evaluations are included to ensure maintenance of allowable design values for the product.

1.8 This specification, or parts thereof, shall be applicable to structural composite lumber portions of manufactured structural components.

1.9 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.10 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.11 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- C177** Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
- C384** Test Method for Impedance and Absorption of Acoustical Materials by Impedance Tube Method
- C423** Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- D9** Terminology Relating to Wood and Wood-Based Products
- D143** Test Methods for Small Clear Specimens of Timber
- D150** Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
- D198** Test Methods of Static Tests of Lumber in Structural Sizes
- D245** Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber
- D669** Test Method for Dissipation Factor and Permittivity Parallel with Laminations of Laminated Sheet and Plate Materials (Withdrawn 2012)³
- D1037** Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
- D1583** Test Method for Hydrogen Ion Concentration of Dry Adhesive Films
- D1666** Test Methods for Conducting Machining Tests of Wood and Wood-Base Panel Materials
- D1761** Test Methods for Mechanical Fasteners in Wood
- D2132** Test Method for Dust-and-Fog Tracking and Erosion

- Resistance of Electrical Insulating Materials
 - D2394** Test Methods for Simulated Service Testing of Wood and Wood-Based Finish Flooring
 - D2395** Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials
 - D2559** Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions
 - D2718** Test Methods for Structural Panels in Planar Shear (Rolling Shear)
 - D2915** Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products
 - D3201** Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products
 - D3755** Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials Under Direct-Voltage Stress
 - D4300** Test Methods for Ability of Adhesive Films to Support or Resist the Growth of Fungi
 - D4442** Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials
 - D4761** Test Methods for Mechanical Properties of Lumber and Wood-Base Structural Material
 - D4933** Guide for Moisture Conditioning of Wood and Wood-Based Materials
 - D5055** Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists
 - D5457** Specification for Computing Reference Resistance of Wood-Based Materials and Structural Connections for Load and Resistance Factor Design
 - D5764** Test Method for Evaluating Dowel-Bearing Strength of Wood and Wood-Based Products
 - D6815** Specification for Evaluation of Duration of Load and Creep Effects of Wood and Wood-Based Products
 - D7247** Test Method for Evaluating the Shear Strength of Adhesive Bonds in Laminated Wood Products at Elevated Temperatures
 - D7480** Guide for Evaluating the Attributes of a Forest Management Plan
 - E84** Test Method for Surface Burning Characteristics of Building Materials
 - E96/E96M** Test Methods for Water Vapor Transmission of Materials
 - E119** Test Methods for Fire Tests of Building Construction and Materials
- ### 2.2 CSA Standards:⁴
- CSA Standards for Wood Adhesives O112-M Series**
 - CSA O325 Construction Sheathing**
- ### 2.3 ISO/IEC Standards:⁵
- ISO/IEC 17020** General Criteria for the Operation of Various Types of Bodies Performing Inspection
 - ISO/IEC 17025** General Requirements for the Competence of Testing and Calibration Laboratories

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Canadian Standards Association (CSA), 5060 Spectrum Way, Mississauga, ON L4W 5N6, Canada, <http://www.csa.ca>.

⁵ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, <http://www.iso.org>.

ISO/IEC 17065 Conformity Assessment – Requirements for Bodies Certifying Products, Processes and Services

2.4 Other Standard:

US Product Standard PS 2 Performance Standard for Wood-Based Structural-Use Panels

3. Terminology

3.1 Definitions—Standard definitions of wood terms are given in Terminology D9.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 Exposure 1 durability—a bond classification for wood-based products that are not permanently exposed to the weather.

3.2.1.1 Discussion—Wood-based products classified as Exposure 1 are intended to resist the effects of moisture on structural performance due to construction delays or other conditions of similar severity.

3.2.2 structural composite lumber (SCL)—in this specification, structural composite lumber (SCL) is any of laminated veneer lumber (LVL), parallel strand lumber (PSL), laminated strand lumber (LSL), oriented strand lumber (OSL), or laminated veneer bamboo (LVB), which are intended for structural use and bonded with an exterior adhesive.

3.2.2.1 laminated strand lumber (LSL)—a composite of wood strand elements with wood fibers primarily oriented along the longitudinal axis of the member, where the least dimension of the wood strand elements is 0.10 in. (2.54 mm) or less and their average lengths are a minimum of 150 times the least dimension of the wood strand elements.

3.2.2.2 laminated veneer bamboo (LVB)—a composite of bamboo strand elements, edge-bonded to form veneer sheets which are then face-bonded to form finished products, with bamboo fibers primarily oriented along the longitudinal axis of the member where the least dimension of strand elements is 0.25 in. (6.4 mm) or less and their average strand lengths are a minimum of 300 times the least dimension of the bamboo strand elements (see X2.2).

3.2.2.3 laminated veneer lumber (LVL)—a composite of wood veneer sheet elements with wood fibers primarily oriented along the longitudinal axis of the member, where the veneer element thicknesses are 0.25 in. (6.4 mm) or less.

3.2.2.4 oriented strand lumber (OSL)—a composite of wood strand elements with wood fibers primarily oriented along the longitudinal axis of the member, where the least dimension of the wood strand elements is 0.10 in. (2.54 mm) or less and their average lengths are a minimum of 75 times the least dimension of the wood strand elements.

3.2.2.5 parallel strand lumber (PSL)—a composite of wood veneer strand elements with wood fibers primarily oriented along the longitudinal axis of the member, where the least dimension of wood veneer strand elements is 0.25 in. (6.4 mm) or less and their average lengths are a minimum of 300 times the least dimension of the wood veneer strand elements.

3.2.3 Discussion—SCL has three mutually perpendicular directions of orientation (see Fig. 1):

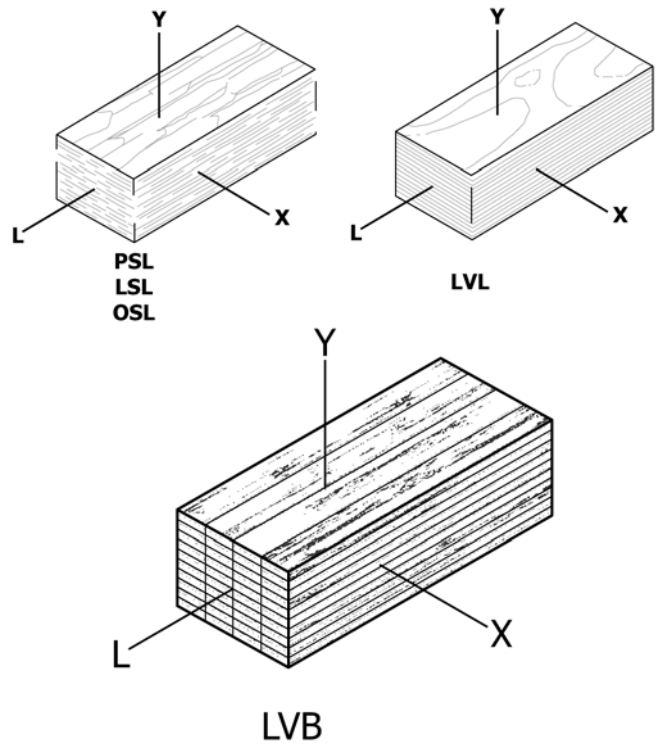


FIG. 1 Orientations for Structural Composite Lumber

L Direction—Parallel to the longitudinal direction of the member.

X Direction—Parallel to a surface of the member and normal to the L direction.

Y Direction—Normal to both L and X direction.

In this specification, longitudinal shear means shear stress in the L-X and L-Y planes. Planar shear is stress in the X-Y plane.

3.2.4 SCL adhesive, n—a material used for adhesion in the manufacturing of SCL products, which could be an SCL binder or non-binder adhesive.

3.2.5 SCL binder adhesive, n—an adhesive that bonds wood elements, such as flakes, strands, particles, or fibers, of SCL products and usually does not form a continuous bondline.

3.2.5.1 Discussion—Current examples of SCL binders include those systems used in the production of LSL and OSL.

3.2.6 SCL non-binder adhesive, n—an adhesive that bonds wood elements, such as veneers and veneer strand elements, of SCL products that is intended to completely cover all of the gluing surfaces.

3.2.6.1 Discussion—Current examples of SCL non-binder adhesives include those systems used in the production of LVL, PSL and LVB.

4. Materials

4.1 General—Structural composite lumber materials conforming to this specification meet the definition of a bio-based product in accordance with 3.3.1 of Guide D7480.

4.2 Wood Elements—Wood elements used in the fabrication of SCL products shall conform to 3.2.

4.3 Adhesives