Designation: D8223 – 19

Standard Practice for Evaluation of Fire-Retardant Treated Laminated Veneer Lumber[1]

This standard is issued under the fixed designation D8223; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers procedures for the evaluation of laminated veneer lumber (LVL) pressure-treated with commercially available fire retardants after exposure to both standard environmental conditions and an extended exposure to elevated temperature.

1.2 LVL products utilizing overlays or fire-retardant paints and coatings require other considerations and are outside of the scope of this practice.

1.3 LVL products manufactured for rim board applications require other considerations and are outside of the scope of this practice.

1.4 This practice provides one method to establish design values for fire-retardant treated (FRT) LVL. It is not intended to preclude the use of alternative methods for deriving design values, such as Test Method D5664 and Practice D6841 for FRT lumber.

1.5 *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.*

1.6 *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]

D9 Terminology Relating to Wood and Wood-Based Products

D3201/D3201M Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products

D5456 Specification for Evaluation of Structural Composite Lumber Products

D5664 Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber

D6841 Practice for Calculating Design Value Treatment Adjustment Factors for Fire-Retardant-Treated Lumber

E84 Test Method for Surface Burning Characteristics of Building Materials

E2768 Test Method for Extended Duration Surface Burning Characteristics of Building Materials (30 min Tunnel Test)

2.2 *Other Standards:*

ANSI/AWC National Design Specification for Wood Construction[3]

AWPA E12 Standard Method for Determining Corrosion of Metal in Contact with Treated Wood[4]

UL 723 Test for Surface Burning Characteristics of Building Materials[5]

3. Terminology

3.1 *Definitions*—Definitions used in this practice are in accordance with Terminology D9 and Specification D5456.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *design value adjustment factor, C_{tr}*—factor used to adjust the design value for FRT LVL that will be exposed to end-use temperatures in excess of 38 °C (100 °F) but not exceeding 66 °C (150 °F), depending on the ratio of $f_{tr,108}$ and $f_{tr,0}$, and the climate zone.

3.2.2 $f_{tr,0}$ —mean property of FRT LVL equilibrated to standard conditions of 6.3.1.

3.2.3 $f_{tr,108}$ —mean property of FRT LVL after 108-day exposure to elevated temperature and relative humidity of 6.3.2.

[1] This test method is under the jurisdiction of ASTM Committee D07 on Wood and is the direct responsibility of Subcommittee D07.07 on Fire Performance of Wood.

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[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] Available from American Wood Council (AWC), 222 Catoctin Circle, SE, Suite 201, Leesburg, VA 20175, http://www.awc.org.

[4] Available from American Wood Protection Association (AWPA), P.O. Box 361784, Birmingham, AL 35236-1784, http://www.awpa.com.

[5] Available from Underwriters Laboratories (UL), 333 Pfingsten Road, Northbrook, IL 60062-2096, https://www.ulstandards.ul.com.

4. Summary of Practice

4.1 This practice establishes requirements for the evaluation of LVL pressure-treated with commercially available fire retardants. The FRT LVL is considered as a new grade of LVL and evaluated in the same manner as a grade of untreated LVL in accordance with Specification D5456 after exposure to environmental conditions specified in 4.2 and 4.3.

4.2 The FRT LVL shall be evaluated for the initial FRT treatment effect after conditioning to the standard moisture conditions specified in 6.3.1. The data from these qualification tests are used to establish the design value in accordance with Specification D5456 for FRT LVL that will be exposed to end-use temperatures not in excess of 38 °C (100 °F).

4.3 The FRT LVL shall be evaluated for the additional hygrothermal effects after an extended exposure to elevated temperature specified in 6.3.2. The data from these qualification tests are used to establish the design value adjustment factors in accordance with 6.5.2 for FRT LVL that will be exposed to end-use temperatures in excess of 38 °C (100 °F) but not exceeding 66 °C (150 °F).

5. Significance and Use

5.1 Design values obtained from 4.2 are permitted for use in design where the end-use temperature does not exceed 38 °C (100 °F).

5.1.1 The mean test values for the properties evaluated in 4.2 ($f_{tr,0}$) and 4.3 ($f_{tr,108}$) shall be used to determine design value adjustment factors for FRT LVL that will be exposed to end-use temperatures in excess of 38 °C (100 °F) but not exceeding 66 °C (150 °F). Temperature adjustment factors in accordance with the National Design Specification for Wood Construction (NDS) shall also be applied in these applications.

6. Procedure

6.1 *Selection of LVL Materials:*

6.1.1 Untreated LVL materials selected for the fire-retardant treatment shall meet pertinent requirements for LVL in Section 4 of Specification D5456.

6.1.2 Sampling requirements for untreated LVL materials selected for the fire-retardant treatment shall meet the requirements specified in Sections 6.1 and 6.2 of Specification D5456.

NOTE 1—Due to possible damage during transportation and handling, additional specimens are recommended to be sampled to ensure a sufficient number of specimens are available for evaluation after the fire retardant treatment.

6.1.3 Samples for fire-retardant treatment shall be prepared to sizes prior to FRT treatment so that the cross-sectional dimensions of the samples are representative of the cross-section dimensions required by Specification D5456 and shall include incising if the actual production requires incising to achieve the targeted fire-retardant chemical retention.

6.1.4 To provide a basis for the quality assurance testing required in Section 10.4 of Specification D5456, untreated LVL materials selected for the fire-retardant treatment shall be pre-evaluated for bending strength and stiffness, tensile strength parallel to grain, moisture content, bond quality, and product durability in accordance with Specification D5456. For untreated LVL that has been previously evaluated in accordance with Specification D5456, this section is not required.

6.2 *Fire Retardant Treatment:*

6.2.1 The fire retardant formulation, and the treatment processes and conditions used for the FRT LVL shall be documented in accordance with the treating plant's quality manual. The retention level of each charge shall not be less than the midpoint of the retention range as specified for the product in the quality manual. Changes in the fire retardant formulation or the treatment processes and conditions shall require a new FRT LVL evaluation.

6.2.2 After the fire-retardant treatment, all specimens shall be re-dried in accordance with the FRT-manufacturer's practice documented in the in-plant quality manual. The treated pieces shall be redried at the maximum specified dry bulb temperature with a –2 °C (4 °F) tolerance for 21 h of the first 24-h period. For the remainder of the drying period, the tolerance shall be –3 °C (5 °F). There is no upper limit on the re-drying temperature. Sticker all test pieces to obtain proper air flow across both surfaces and to provide even drying. Subsequent changes using a faster or hotter re-drying schedule shall require a new FRT LVL evaluation.

6.3 *Pre-Evaluation Conditioning:*

6.3.1 *Specimens Tested for Initial Treatment Effect*—After re-drying, all treated specimens for the initial FRT treatment effect shall be equilibrated to constant weight at 20 ± 6 °C (68 ± 11 °F) and 65 % relative humidity in accordance with Section 6.3 of Specification D5456 before evaluation testing in accordance with 6.4.

6.3.2 *Specimens Tested After Hygrothermal Effect*—After re-drying, all treated specimens for the additional hygrothermal effects shall be conditioned at 66 ± 2 °C (150 ± 4 °F) and 50 % or higher relative humidity for 108 ± 3 days. Upon completion of the elevated temperature exposure, the specimens shall be re-equilibrated to constant weight at 20 ± 6 °C (68 ± 11 °F) and 65 % relative humidity in accordance with Section 6.3 of Specification D5456 before evaluation testing in accordance with 6.4.1.

NOTE 2—Appendix X1 provides background information for this test protocol.

6.4 *Evaluation of FRT LVL Properties:*

6.4.1 All mechanical and physical properties, connections, shear modulus, bond durability, and product durability of the FRT LVL shall be evaluated by qualification testing in accordance with Specification D5456 after environmental conditioning in accordance with 6.3.1 and 6.3.2.

6.4.2 Surface burning characteristics of the FRT LVL after environmental conditioning in accordance with 6.3.1 shall be evaluated in accordance with Test Method E84 or UL 723 extended to 30 min. Only the wide face of the FRT LVL is required to be tested. The FRT LVL shall have a flame-spread index of 25 or less for the 10-min test in accordance with Test Method E84 or UL 723 and the flame front shall not progress more than 3.2 m (10.5 ft) beyond the centerline of the burners at any time during the entire 30-min test.

6.4.2.1 Alternatively, surface burning characteristics of the FRT LVL after environmental conditioning in accordance with