



Designation: D5572 – 95 (Reapproved 2019)

Standard Specification for Adhesives Used for Finger Joints in Nonstructural Lumber Products¹

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1. Scope

1.1 This specification establishes performance levels for adhesives to be used in finger joints in nonstructural bonded-lumber products. Such products include, but are not limited to, interior and exterior mouldings, window and door components or parts, and bonded-lumber panels. Adhesives that meet the requirements of the various performance classes are considered capable of providing an adequate bond for use under the conditions described for the class. This specification is to be used to evaluate adhesives as well as the adhesive bonds in the finger joints. See Section 5, Significance and Use, for limitations when using this specification to evaluate industrially manufactured finger joints.

NOTE 1—This specification supersedes the finger-joint portion of the 1990 edition of Specification D3110.

1.2 The following index is provided as a guide to the test methods in this specification:

| | Section |
|--|---------|
| Apparatus | 6 |
| Equipment, Material, and Preparation of Assemblies and Specimens | 7 |
| Conditioning for Factory-Manufactured Assemblies, Laboratory-Made Assemblies, and Test Specimens | 8 |
| Testing in Flexure | 9 |
| Testing in Tension | 10 |
| Exposure Conditions and Treatments | 11 |
| 1. Dry Use Tests: Dry, 3-cycle Soak, Elevated Temperature, and Temperature-Humidity | 11.1 |
| 2. Wet Use Tests: Dry, Boil, Elevated Temperature, and Vacuum-Pressure | 11.2 |

NOTE 2—The conditioning needed for various stages in the preparation of both types of specimens and for the exposure tests are given.

NOTE 3—Specific guidelines for specimen size, exposure conditions, testing, calculation, and reporting are given for flexure specimens in Sections 9 and 11, and for tension specimens in Sections 10 and 11.

1.3 For the definitions of *dry use* and *wet use*, see 3.2.1.1 and 3.2.1.2.

1.4 The values stated in inch-pound units are to be regarded as standard. The SI units given in parentheses are for information only.

¹ This specification is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D14.30 on Wood Adhesives.

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1.5 The following precautionary caveat pertains only to the apparatus and test methods portions, Sections 6 – 11 of this specification: *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

- D143 Test Methods for Small Clear Specimens of Timber
- D907 Terminology of Adhesives
- D3110 Specification for Adhesives Used in Laminate Joints for Nonstructural Glued Lumber Products (Withdrawn 1996)³
- D4442 Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials
- D4688 Test Method for Evaluating Structural Adhesives for Finger Jointing Lumber
- D5266 Practice for Estimating the Percentage of Wood Failure in Adhesive Bonded Joints
- E4 Practices for Force Verification of Testing Machines
- E6 Terminology Relating to Methods of Mechanical Testing
- E41 Terminology Relating to Conditioning (Withdrawn 2019)³
- E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods
- E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

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.

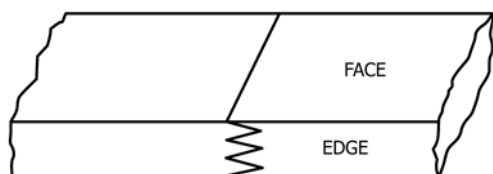


FIG. 1 Horizontal Joint

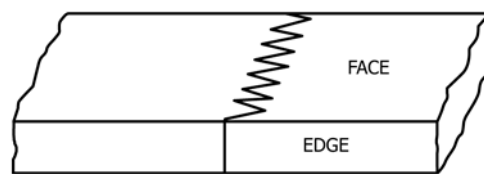


FIG. 2 Vertical Joint

3. Terminology

3.1 Definitions:

3.1.1 Many terms in this specification are defined in Terminology [D907](#) and Terminology [E41](#).

3.1.2 *bond, n*—the union of materials by adhesives.

3.1.3 *finger joint, n*—a joint formed by bonding two precut members shaped like fingers. (See [Figs. 1 and 2](#).)

3.2 Definitions of Terms Specific to This Standard:

3.2.1 nonstructural adhesive:

3.2.1.1 *dry use nonstructural adhesive, n*—an adhesive capable of producing sufficient strength and durability to make the bonded lumber product serviceable in nonstructural use, under conditions in which the equilibrium moisture content (EMC) of the wood does not exceed 16 %.

3.2.1.2 *wet use nonstructural adhesive, n*—an adhesive capable of producing sufficient strength and durability to make the bonded lumber product serviceable in nonstructural use, under conditions in which the EMC of the wood may be 16 % or greater.

3.3 Abbreviations:

3.3.1 *EMC*—equilibrium moisture content.

3.3.2 *MC*—moisture content.

4. Test Requirements

4.1 Adhesives:

4.1.1 To comply with this specification the test adhesive shall be tested for performance in accordance with Sections [8.1.1 – 11](#), and it shall meet the requirements in [Table 1](#) for the selected testing mode and performance classification.

4.1.2 Compliance with this specification shall warrant certification of the adhesive for use on the species of wood that is used for the tests, or for use on a designated group of species when tested and found to be in compliance for any one member of said group of species. The designated species groupings for commonly used domestic and imported woods, as accepted in this specification, are given in [Table 2](#). In the event that the user or supplier of the adhesive, or both, cannot accept the designated groupings in [Table 2](#), either party shall have the option of requesting a test on an individual species. Furthermore, the user and supplier may agree to change any of the wood-failure requirements of [Table 1](#) when applied to tests on Groups 3 and 4 hardwoods from [Table 2](#). For wood-property information on imported woods, see the *Wood Handbook*.⁴

4.1.2.1 The wood-failure requirements listed in [Table 1](#) are given for softwoods and hardwoods. [Table 1](#) shows that the wood-failure requirements for hardwood are 50 % of the requirements for softwoods.

4.2 *Industrially Manufactured Finger Joint*—An industrially manufactured finger joint may be used to evaluate the adhesive, provided its construction meets the requirements set forth in Sections [7 – 10](#), and the joint is tested against the requirements in [Table 1](#).

5. Significance and Use

5.1 Adhesives are classified as dry use or wet use. Each classification includes consideration of short-term in-transit exposure conditions at elevated temperatures up to 220°F (104°C).

5.2 The initial development of Specification [D3110](#) was based on finger-joint assemblies made under controlled laboratory conditions. In the development of this revised specification the results obtained with laboratory-made specimens (see [12.1.2](#)) were compared to those obtained with industrially manufactured specimens (see [12.1.1](#)). These finger joints were prepared using previously certified adhesives in cooperation with a manufacturer or equipment supplier who had the necessary finger-joint cutter and assembly equipment. These finger joints may vary in geometry and length from manufacturer to manufacturer, and this variation could affect the performance of the bonded-finger-joint assembly.⁵ (See [12.1](#), [12.4](#), and [12.5](#).) [Fig. 3](#) depicts a sample finger-joint configuration.

5.2.1 When changes are made in the design of the industrially manufactured finger joint, the new design should be compared to a control design that has been used successfully.

5.3 An industrially manufactured finger joint should be evaluated using the requirements for compliance with this specification, in accordance with [4.1](#). When this specification is used to evaluate specimens made from field-manufactured assemblies, the results may not compare favorably with those run on specimens made from laboratory-made assemblies.

5.4 Test requirements are provided to determine if the adhesive is suitable for dry use or wet use.

5.5 The dry test and exposure conditions and treatments are to evaluate adhesives used in nonstructural finger joints for typical service conditions.

⁴ U.S. Department of Agriculture Forest Service; Agricultural Handbook, No. 72, *Wood Handbook*, Tables 3 and 4, 1987 edition, pp. 3–11.

⁵ Selbo, M. L., “Effects of Joint Geometry on Tensile Strength of Finger Joints,” *Forest Products Journal*, Vol 13, No. 9, September 1963, pp. 390–400.

TABLE 1 Minimum Test Requirements

| Performance Classification and Exposure Conditions ^A | Subsection Number for Exposure Description | Testing Mode Tension ^B | | | | Testing Mode Flexure | |
|---|--|-----------------------------------|----------------------------|-----------|---------------------------------|--------------------------------|-------------|
| | | Strength, psi (MPa) ^C | Wood Failure ^D | | Modulus of Rupture ^C | | |
| | | | Group Average ^E | | Individual Minimum ^F | | |
| | | | % | | | Minimum psi (MPa) ^G | |
| | | Soft Wood | Hard Wood ^H | Soft Wood | Hard Wood ^H | | |
| Dry Use: | | | | | | | |
| Cured (dry) | 11.1.1 | 2000 (13.8) | 60 | 30 | 30 | 15 | 2000 (13.8) |
| Three-cycle soak | 11.1.2 | 1000 (6.9) | 30 | 15 | 15 | / | 1000 (6.9) |
| Elevated Temperature ((220°F (104°C)) | 11.1.3 | 1000 (6.9) | / | / | / | / | / |
| Temperature-Humidity ((140°F (60°C), 16 % EMC)) | 11.1.4 | 750 (5.2) | / | / | / | / | / |
| Wet Use: | | | | | | | |
| Cured (dry) | 11.2.1 | 2000 (13.8) | 60 | 30 | 30 | 15 | 2000 (13.8) |
| Boil | 11.2.2 | 1600 (11.0) | 50 | 25 | 25 | / | 1400 (9.7) |
| Elevated Temperature ((220°F (104°C)) | 11.2.3 | 1000 (6.9) | / | / | / | / | / |
| Vacuum Pressure | 11.2.4 | 1600 (11.0) | 50 | 25 | 25 | / | 1400 (9.7) |

^A Twenty specimens required for each classification and exposure.

^B Parallel to the grain.

^C Tension and flexure results may vary with the species. Any acceptable wood should produce joints able to meet these requirements.

^D The wood-failure requirements are given for softwoods and hardwoods. Groups 3 and 4 hardwoods are listed at 50 % of the softwood value, with no wood-failure requirement if the calculation is 15 % or less. (See 4.1.2.)

^E For total group of specimens tested.

^F For 90 % of the specimens tested, they shall meet or exceed these minimum wood-failure values shown. If a zero value is obtained for any of the specimens (the specimen must meet the strength requirement).

^G For any individual specimen.

^H See recommended minimum specific gravity in Table 2.

/ No requirement.

5.5.1 The 220°F (104°C) test, a more severe test, is designed to evaluate the product after exposure to short-term elevated-temperature conditions. This test is intended to simulate conditions that might be experienced in transit, further processing, or in-service conditions.

NOTE 4—These typical service conditions could include stress and time under stress, as well as elevated temperature.

5.6 Procedures are described in sufficient detail to permit duplication in different testing laboratories.

5.6.1 Record any deviations in these procedures on the report forms, Appendix X1, as it may have an impact on the results obtained. Test data are only valid for the length and design used. (See 12.4.)

5.7 To avoid potential problems that would be caused by interrupting the bonding process, the adhesive-performance level should be determined by the finger-joint manufacturer prior to handling and early shipment. Before beginning the full testing process, the testing laboratory should pull a representative sample and check the dry strength first, in order to ensure that the product basically conforms with the performance level certified by the adhesive manufacturer.

TEST METHODS

6. Apparatus

NOTE 5—The finger-joint specimens to be broken in tension are shorter than those to be broken in flexure. Accommodation must be made in the equipment for handling the larger flexure specimen.

6.1 *Environmental Chamber (For Moist-Heat Aging)*, capable of conditioning specimens at 80 ± 5°F (27 ± 3°C) and

80 ± 5 % relative humidity and capacity for at least 20 specimens well-spaced and supported on racks to allow free air flow.

6.2 *Oven(s)*, with sufficient air circulation to remove moisture from the chamber, and capable of meeting all the following temperature requirements: 105 ± 5°F (41 ± 3°C) (see 11.1.2); 220 and 230 ± 5°F (104 and 110 ± 3°C) (see 11.1.3 and 11.2.3); 150 ± 2°F (65 ± 1°C) (see 11.1.4); and 145 ± 5°F (63 ± 3°C) (see 11.2.2).

6.3 *Tank for Soaking*, capacity to meet the requirements of 11.1.2, so that all of the specimens are at least 2 in. (50.8 mm) below the water level for the duration of the soak cycles.

6.4 *Tank for Boiling*, capacity to meet the requirements of 11.2.2, so that all of the specimens are at least 2 in. (50.8 mm) below the water level for the duration of the boil cycles.

6.5 *Testing Machine for the Flexure Specimen*, capacity of not less than 2200 lbf (1000 kgf) in compression, equipped for one-third span, two-point loading as described in 9.5 and shown in Fig. 4, capable of maintaining a uniform rate of loading such that the load may be applied with a continuous motion of the movable head to maximum at a rate of 0.5 in. (11.7 mm)/min with a permissible variation of ±10 %, and located in an atmosphere such that the moisture content of the specimens developed under the conditions prescribed in Section 11 is not noticeably altered during testing.

6.6 *Testing Machine for the Tension Specimen*, capable of applying a calibrated tensile force, equipped with grips of sufficient length to hold the specimen firmly, preferably a