



Designation: ~~D7470–08 (Reapproved 2015)~~ D7470 – 21

Standard Practice for Evaluating Elevated Temperature Performance of End- Jointed Lumber Studs¹

This standard is issued under the fixed designation D7470; 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 is to be used to evaluate the elevated temperature performance of end-jointed lumber studs.

1.2 A symmetric wall assembly containing end-jointed lumber studs is exposed to a standard fire exposure specified in Test Methods [E119](#).

1.3 End-jointed lumber studs are deemed qualified if the wall assembly resists a standard fire exposure specified in Test Methods [E119](#) for a period of 60 min or more. Qualification of end-jointed lumber studs are restricted to the joint configuration and adhesive tested.

1.4 This practice is used to evaluate the performance of end-jointed lumber studs to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment under actual fire conditions.

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

1.6 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

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1.7 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

¹ This practice 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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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.

[C1396/C1396M Specification for Gypsum Board](#)

[D9 Terminology Relating to Wood and Wood-Based Products](#)

[D4688 Test Method for Evaluating Structural Adhesives for Finger Jointing Lumber](#)

[D6513 Practice for Calculating the Superimposed Load on Wood-frame Walls for Standard Fire-Resistance Tests](#)

[E119 Test Methods for Fire Tests of Building Construction and Materials](#)

[F1667 Specification for Driven Fasteners: Nails, Spikes, and Staples](#)

2.2 *Other Standards:*

[ANSI/AWC NDS National Design Specification for Wood Construction](#)³

3. Terminology

3.1 *Definitions:*

3.1.1 For general definitions of terms related to wood, refer to Terminology [D9](#).

3.2 *Definitions: Definitions of Terms Specific to This Standard:*

3.2.1 *end joint, n*—joint formed by adhesive bonding of machined, mated surfaces at the ends of two pieces of lumber.

3.2.1.1 *Discussion—*

Typical end-joint configurations include finger joints and scarf joints.

3.2.2 *end-jointed lumber—lumber, n*—~~Lumber~~lumber containing one or more ~~end-joints~~end joints.

3.2.3 ~~end-joints—finger joint, n~~—~~a~~end joint formed by ~~bonding two pieces of lumber end-to-end, often by machining a set of interlocking “fingers” (finger-joint) into each end of adjoining pieces, using an adhesive to form an adhesive bonded joint.~~multiple interlocking tapered profiles (“fingers”).

3.2.4 ~~qualified agency—scarf joint, n~~—~~an organization, hereafter referred to as the agency, that has trained personnel and procedures to ensure the grades comply with all applicable requirements of this practice. The agency shall have no financial interest in, nor shall be financially dependent upon, any single company manufacturing the product being inspected or tested; and shall not be owned, operated, or controlled by any such company.~~end joint formed by a single tapered profile.

4. Summary of Practice

4.1 This practice shall be used to evaluate end-jointed lumber studs manufactured with a specific joint configuration and adhesive. This practice is intended to be limited to the evaluation of end-jointed lumber studs with a specific joint configuration, adhesive, and limited design properties. The results are only applicable to end-jointed lumber studs using a joint configuration with the same number of fingers and a finger length of at least equal length as qualified in [7.1.2](#) and shall have assigned design properties no greater than the grade level qualified in [7.1.2](#).

5. Significance and Use

5.1 End-jointed lumber studs used in fire resistance-rated assemblies shall be able to support the superimposed design load for the specified time under an elevated temperature exposure, when a wall assembly is exposed to a standard fire specified in Test Methods [E119](#). Light-weight wood assemblies utilize gypsum wallboard or other types of membrane protection to accomplish a requisite fire resistance rating for the assembly. However, wood studs and the ~~end-joints~~end joints in the studs shall resist the developed elevated temperature environment for the duration of the rating. This practice provides a method for evaluating the elevated temperature performance of an assembly constructed with end-jointed studs having fire performance comparable to an assembly constructed with solid-sawn studs.

6. Wall Assembly

6.1 A load-bearing wall meeting the following assembly description shall be used:

6.1.1 *Framing Elements:*

³ Available from American Wood Council (AWC), 1111 Nineteenth Street, NW, Suite 800, Washington, DC 20036, <http://www.awc.org>.

6.1.1.1 *Studs*—Nine pieces of 2 by 4 (nominal) end-jointed lumber shall be used for wall studs. Each piece of end-jointed lumber shall be 115.5 in. (2934 mm) long and have at least one end-joint end joint within the middle third of the length. Studs shall be symmetrically placed within the 10-ft-10 ft (3 m) long by 10-ft-10 ft (3 m) high wall assembly with interior studs spaced 16 in. (406 mm) on center as shown in Fig. 1. The moisture content of the end-jointed lumber shall be no greater than 15 % at the time of the fire test.

NOTE 1—When producing end-jointed lumber for use in this standard practice, consideration should be given to the unique production conditions, such as wood moisture content, applied spread rate, pressure, and curing temperature of the adhesive in accordance with the adhesive manufacturer’s recommendations.

6.1.1.2 *Plates*—Studs shall be attached to a double top plate and a single bottom plate as shown in Fig. 1. Plates shall be the same species as the stud material. The first top plate and the bottom plate shall be attached to the studs using 2-16d common nails or 3-16d box nails. The second top plate is attached to the first top plate using a single row of 16d common nail at 16 in. (406 mm) on center or 1-16d box nails at 12 in. (305 mm) on center. Nails shall be in accordance with Specification F1667.

NOTE 2—In Fig. 1, double top plates are located at the bottom of test wall to be adjacent to the movable load beam. Double top plates are located at the top of the test wall when the load beam is along the top.

6.1.1.3 *Blocking*—Blocking between studs shall not be permitted.

6.1.2 *Insulation*—The cavity between studs shall be filled with 3½-in. (89-mm) 3½ in. (89 mm) thick mineral wool insulation having a nominal density of 2.5 pcf (40 kg/m³).

6.1.3 *Sheathing*—A single layer of 5/8-in. (16-mm) 5/8 in. (16 mm) Type X gypsum wallboard (in accordance with Specification

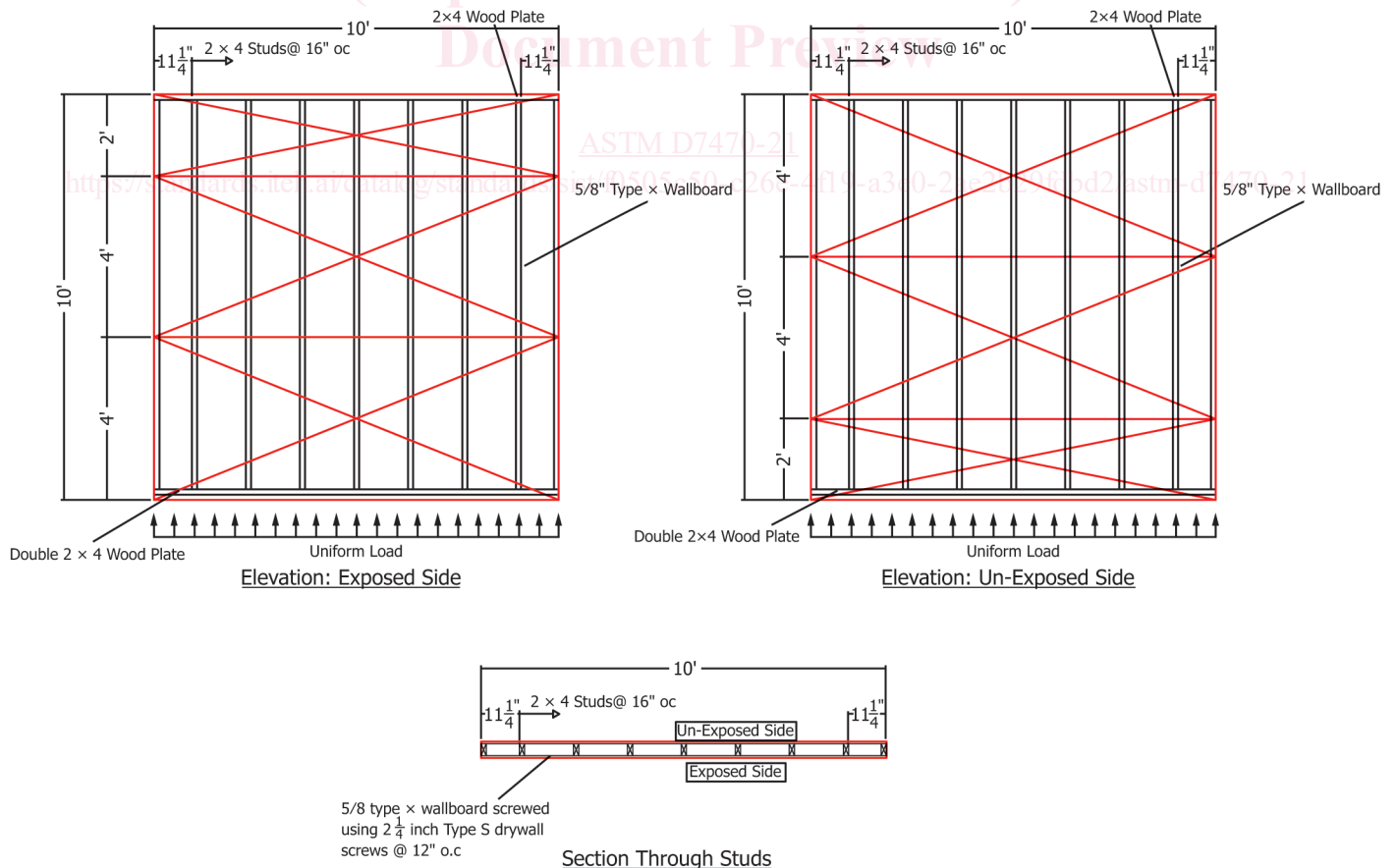


FIG. 1 Assembly Details