Designation: ~~E695 – 03 (Reapproved 2015)$^{\varepsilon 1}$~~ E695 – 22

Standard Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading[1]

This standard is issued under the fixed designation E695; 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.

~~ε^1 NOTE—Units information was editorially corrected in March 2015.~~

1. Scope

1.1 This test method covers the measurement of the relative resistance of wall, floor, and roof construction to impact loading. The test is not applicable to doors.

1.2 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.

1.3 *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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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]

D1517 Terminology Relating to Leather
E73 Practice for Static Load Testing of Truss Assemblies
E575 Practice for Reporting Data from Structural Tests of Building Constructions, Elements, Connections, and Assemblies
E631 Terminology of Building Constructions
E661 Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads

2.2 *Other ~~Standards:~~Standard:*[3]

~~Fed. Spec. V-T-291E(1)~~ Fed. Spec. A-A-50197A Linen, Thread

3. Terminology

3.1 *Definitions*—For definitions of terms related to this standard, see Terminology E631.

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[1] This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.11 on Horizontal and Vertical Structures/Structural Performance of Completed Structures.

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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~~standard's Document Summary page on the ASTM website.

[3] Available from ~~DLA Documents Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.~~U.S. General Services Administration, 1800 F Street, NW Washington, DC 20405, https://fedspecs.gsa.gov.

4. Significance and Use

4.1 The procedures outlined will provide data that can be used to evaluate the relative performance of wall, floor, and roof constructions under conditions representative of those sustained in actual service when subjected to impact by a heavy blunt object. See Test Method E661 for evaluation of floor and roof sheathing and Practice E73 for evaluation of roof trusses.

4.2 The method is intended to be applied to relatively light construction, including, but not limited to, wood floor and roof systems, partitions framed with wood or steel studs, steel floor or roof decking systems, steel siding and wall panels, or thin concrete and masonry walls or slabs and similar assemblies.

5. Summary of Method

5.1 Specimens of wall, floor, and roof construction are subjected to the impact force of a standard impact instrument. Wall sections are tested in the vertical position. Floor and roof sections are tested only in the horizontal position. Because of the inherent differences in the method of applying load, measurements obtained from tests in a horizontal mode are not comparable to measurements obtained from tests in the vertical mode.

6. Apparatus for Floor and Roof Systems, Specimen Horizontal (see Fig. 1)

6.1 *Supports,* steel rollers, two, on a rigid base.

6.2 *Impact Instrument,* made with a shot-filled leather bag as specified in 6.2.1 – 6.2.6. (see Fig. 2.)

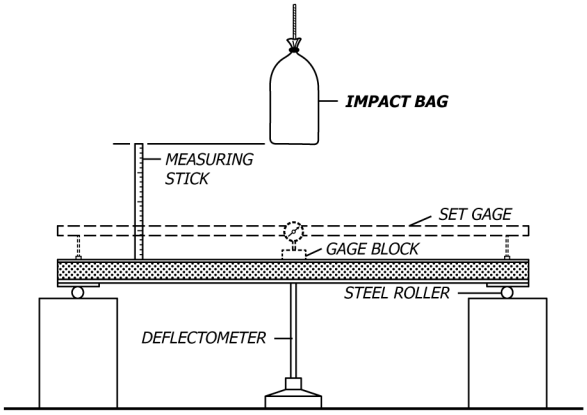
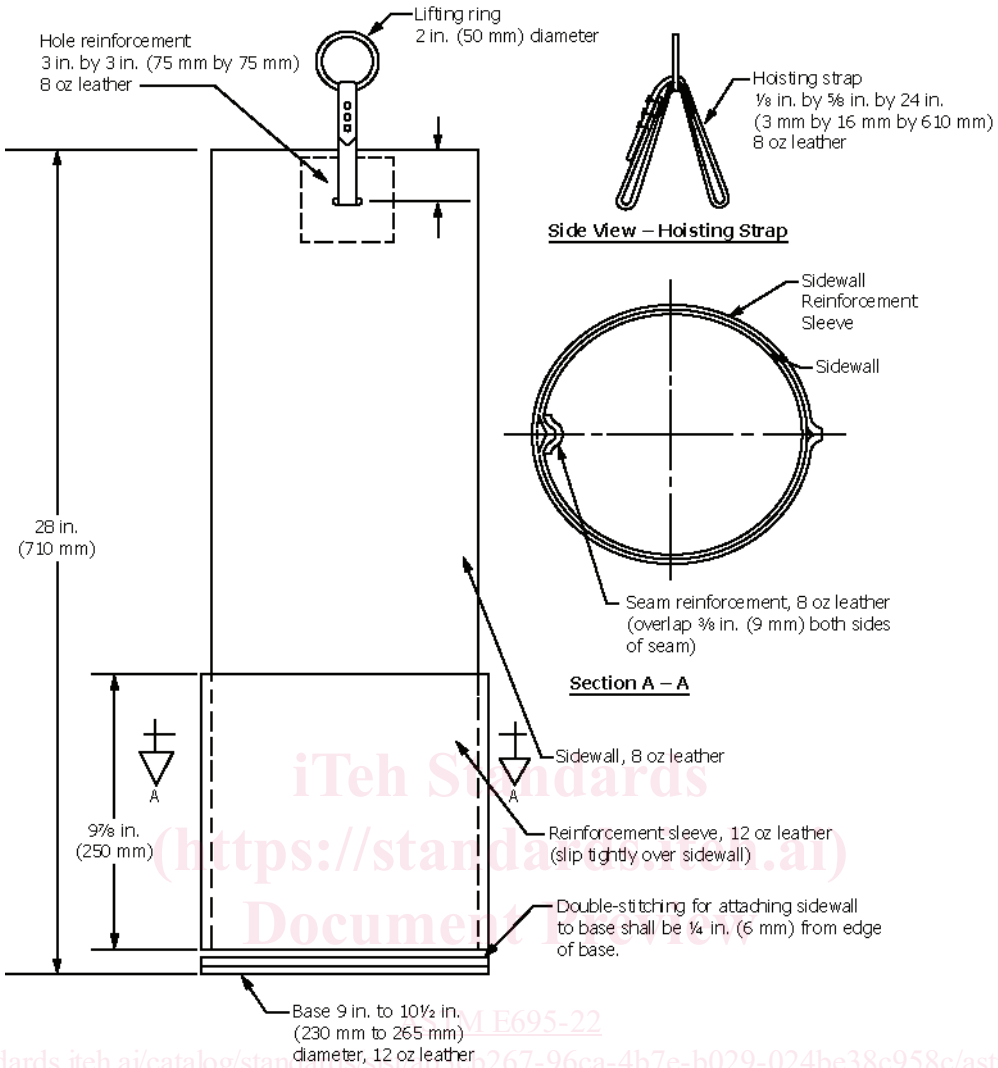


FIG. 1 Impact Load Test (Specimen Horizontal)



(1) Leather—Use harness leather (oak tanned from packer hides) or latigo leather (alum and vegetable tanned) (see Terminology D1517, E631 for definitions and terms) ~~(1-oz~~(1 oz leather = 1/64 in. (0.4 mm) thick).

(2) Thread—Use linen thread (minimum four-ply) in accordance with ~~Fed. Spec. V-T-291E(1),~~Fed. Spec. A-A-50197A, Type ~~B,~~II, Class 1 or 2. Double-stitch sidewall seam and seam attaching sidewall to the base.

(3) Shot—Use shot ~~(0.039~~(0.039 in. to 0.138 in. ~~(1~~(1 mm to 3.5 mm) diameter). Fill bag with shot and cover with two layers of 3 in. (76 mm) foam rubber.

FIG. 2 Leather Drop Bag Assembly

6.2.1 *Leather*—The leather used in construction of the bag should be harness leather (Note 1), oak tanned (Note 1) from packer hides (Note 1) or latigo leather (Note 1), alum and vegetable tanned, or both. Leather thickness shall be expressed in ounces (Note 1) (1 oz = 1/64 in. (0.4 mm)).

NOTE 1—See Terminology D1517.

6.2.2 *Thread*—Thread used in fabrication of the bag shall be linen thread of four or more plys, meeting the requirements for Type ~~B,~~II, Class 1 or 2, of ~~Fed. Spec. V-T-291E(1)~~ (Fed. Spec. A-A-50197A.~~1).~~

6.2.3 *Fabrication*—The side of the bag shall be 28 in. (710 mm) high by 29 in. (735 mm) in circumference, with a sidewall of ~~8-oz~~8 oz leather ⅛ in. (3 mm) thick. The vertical edges shall be sewed together flesh side out and the seam shall be reinforced with a piece of ~~8-oz~~8 oz leather overlapping ⅜ in. (10 mm) each side. The side shall then be turned hair side out and sewed to the bottom. The base (bottom disk) shall be 9 in. (230 mm) in diameter of ~~12-oz~~12 oz leather 3/16 in. (5 mm) thick. The seam

attaching the wall to the base shall be ¼ in. (6 mm) from the edge of the base. Two rows of stitching shall be used for the vertical wall seam and the seam attaching the wall to the base.

6.2.4 *Hoisting Strap*—The strap to hoist the bag shall be made from ~~8-oz~~8 oz leather ⅛ in. (3 mm) thick by ⅝ in. (16 mm) wide by 24 in. (610 mm) long. The strap shall be passed through holes, diametrically opposite, in the side walls 1½ in. (40 mm) from the top of the wall. These holes shall be reinforced with pieces of ~~8-oz~~8 oz leather and 3 in. (76 mm) square. The leather strap shall be passed twice through a ~~2-in. (50-mm)~~2 in. (50 mm) diameter lifting ring and the ends fastened by sewing, riveting, or by use of a buckle. To avoid excessive stretching of the leather wall or failure of the vertical seam, a sleeve, made from ~~12-oz~~12 oz leather, of the same type as the base of the bag, shall be fitted to slip tightly around the lower portion of the bag. This sleeve should be 9⅝ in. (250 mm) high.

6.2.5 *Shot*—The bag shall be loosely filled with metal shot or pellets with diameters of ~~0.039~~0.039 in. to 0.138 in. (~~1~~(1 mm to 3.5 mm). Two layers of ~~3-in. (75-mm)~~3 in. (75 mm) thick foam rubber or similar padding shall be placed over the lead shot to prevent spillage during testing.

6.2.6 The total mass of the bag, including shot, shall be adjusted to the desired level with an accuracy of ±1 %. The mass of the bag may be adjusted to any specified mass, depending upon the information desired.

6.3 *Measuring Sticks*—A stick, laid off in ~~6-in. (150-mm)~~6 in. (150 mm) increments, or a series of sticks the lengths of which are multiples of 6 in. (152 mm), to measure the height of drop accurately. A graduated sliding pointer, a standard metal tape measure, or any similar device that can accurately measure the height of drop may be substituted.

6.4 *Deflectometer,* or other suitable deflectometer equipment, consisting of a metal tube having a base at the lower end and a clamp at the upper end which supports, by friction, a light metal rod. The rod shall be movable inside the tube and shall be graduated to ~~0.01-in. (0.25-mm)~~0.01 in. (0.25 mm) divisions.

6.5 *Set Gage,* consisting of a light, rigid frame having two legs at one end and one leg at the other end, with the distance between the legs equal to the span of the specimen. A dial micrometer graduated to ~~0.001-in. (0.025-mm)~~0.001 in. (0.025 mm) divisions shall be attached to the frame at midlength.

6.6 *Gage Blocks,* ~~1~~2 in. by 12 in. (~~300~~(300 mm by 300 mm) in area, and constructed of metal or other hard surface material.

6.7 *Hold-Downs*—Clamps or other restraining devices at the specimen ends to minimize translation.

7. Apparatus for Wall Systems, Specimen Vertical (see Fig. 3)

7.1 *Steel Channels,* for support of the specimen at top and bottom.

7.2 *Rollers,* cylindrical rollers and two supporting rollers.

7.3 Impact bag, measuring sticks, deflectometer, set gage, and gage blocks conforming to the requirements specified in 6.2 – 6.7.

7.4 *Rigid Supporting Frame,* to which the supporting channels and deflection gage are attached.

8. Test Specimen

8.1 *Size*—The specimens shall be representative of the actual construction as to material, method of assembly, and workmanship.

8.2 *Length or Height*—The length or height of specimen for each element shall be chosen to conform approximately to the length or height of that element in actual size.

8.3 *Width*—The width of specimen shall be chosen, insofar as feasible, to include several of the principal load-carrying members to ensure that the behavior under load will simulate that anticipated under service conditions. The actual width of specimens shall be a whole number multiplied by the spacing of the principal load-carrying members, except for prefabricated panels for which