



Designation: E 1803 – 99

Standard Test Methods for Determining Structural Capacities of Insulated Panels¹

This standard is issued under the fixed designation E 1803; 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 approval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods cover procedures for determining strength and stiffness properties under specified loads of prefabricated insulated panels. These specified loads include:

- 1.1.1 Transverse loads,
- 1.1.2 Axial loads,
- 1.1.3 Shear loads,
- 1.1.4 Uplift loads,
- 1.1.5 Cold creep,
- 1.1.6 Impact loads, and
- 1.1.7 Concentrated loads.

1.2 Structural insulated panels are intended for use in permanent building structures.

1.3 These test methods are not intended for quality control purposes and do not evaluate the individual components of the structural insulated panels.

1.4 These test methods are not intended to measure dimensional stability.

1.5 The text of this standard references notes and footnotes, excluding tables and figures, which provide explanatory information. These notes and footnotes shall not be considered requirements of the standard.

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.*

2. Referenced Documents

2.1 ASTM Standards:

D 1037 Methods for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials²

E 72 Methods of Conducting Strength Tests of Panels for Building Constructions³

¹ These test methods are under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and are the direct responsibility of Subcommittee E06.11 on Horizontal and Vertical Structures/Structural Performance of Completed Structures.

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² *Annual Book of ASTM Standards*, Vol 04.10.

³ *Annual Book of ASTM Standards*, Vol 04.07.

E 455 Method for Static Load Testing of Framed Floor or Roof Diaphragm Constructions for Buildings³

E 575 Practice for Reporting Data from Structural Tests of Building Constructions, Elements, Connectors, and Assemblies³

E 631 Terminology of Building Constructions³

E 695 Method for Measuring Relative Resistance of Wall, Floor, and Roof Constructions to Impact Loading³

3. Terminology

3.1 Definitions are in accordance with Terminology E 631 unless otherwise indicated.

3.2 Definition of Term Specific to This Standard:

3.2.1 *insulated panel, n*—a prefabricated assembly consisting of an insulating core with a minimum thickness of 38 mm (1.5 in.) laminated between two facings.

4. Summary of Test Methods

4.1 Insulated panels are tested using various structural loading methods to determine their strength and stiffness properties for use as elements in permanent structures.

5. Significance and Use

5.1 Insulated panels are used as roof, wall, and floor components in building structures. The structural performance properties need to be determined for design purposes.

TEST METHODS

6. Transverse Loads for Wall, Roof, and Floor Panels

6.1 Insulated panels shall be tested in accordance with Methods E 72, Section 11, with the following modifications:

6.2 Support conditions shall closely represent actual construction and the bearing area shall be the minimum area required by the manufacturer.

6.3 Incremental loads shall be applied.

6.3.1 The deflection shall be recorded at initial load and after each increase in load increment.

6.4 After 0.75, 1.50, and 2.0 times the anticipated design load is achieved, decrease the load to the initial load and record the set. Continue incremental loads and record the deflections at each load until further loading risks damage to the deflection measuring devices.

6.5 Increase the load continuously until the maximum load that can be applied to the panel is determined.

7. Axial Loads for Load Bearing Wall Panels

7.1 Insulated panels shall be tested in accordance with Methods E 72, Section 9, with the following modifications:

7.2 Bearing conditions at the bottom of the panel shall be according to manufacturers' requirements.

7.3 A minimum of one gage at midwidth is required to measure axial displacement and a minimum of one gage located at midspan is required to measure transverse displacement. See Fig. 1.

8. Racking Load for Wall Systems

8.1 Insulated panels shall be tested in accordance with Methods E 72, Section 14, with the following modifications:

8.2 This test is conducted using the structural insulated panel manufacturer's method for attaching the panels together and for attaching the panels to the top and bottom plates. The panels are not attached to an external prefabricated framework. Apply the load through the load beam to the top plate.

8.3 Test Specimens:

8.3.1 The test specimen shall be a minimum of 2.4 by 2.4 m (8 by 8 ft) consisting of a minimum of two 1.2 by 2.4 m (4 by 8 ft) panels. It is the intent of this test procedure to evaluate the panels and the attachment system.

8.3.2 The method of installation shall be according to the manufacturer's requirements. Fasteners or adhesives, or both, shall be of the type and spacing intended for actual construction. Vertical boundary members shall be installed per the manufacturer's requirements at the ends of shear walls. See Fig. 2.

9. Diaphragm Testing for Floor or Roof Constructions

9.1 Insulated panels shall be tested in accordance with Method E 455 with the following modifications:

9.2 Cantilever Diaphragm and Simple Beam Diaphragm:

NOTE 1—The test assembly will be at least 2.4 by 4.8 m (8 by 16 ft) if the smallest element is 1.2 by 2.4 m (4 by 8 ft).

9.2.1 Add to 4.1.3.1 of Method E 455: the diaphragm shall contain not less than four individual elements.

9.2.2 Modify paragraph 7.2 to read at 0.75, 1.5, and 2 times the anticipated design load remove the load and measure the recovery after 5 min. Delete the 10 min requirement to reach full design load.

NOTE 2—Because framing inside of sandwich panels is not accessible for inserting and tightening nuts, washers, and bolts, small access openings through one or both faces may be required. These are acceptable provided qualification tests conducted with the holes in place.

10. Uplift Resistance for Roof Panel Attachment

10.1 Insulated panels and the fastening system shall be tested in accordance with Methods D 1037 for fastener head pull through. Sections 54 through 60 of Methods D 1037 shall be used with the following modifications:

10.1.1 Specimens shall be tested in the dry condition only.

10.1.2 Fasteners of the type intended for use in service shall be tested.

11. Cold Creep for Roof and Floor Insulated Panels

11.1 *Introduction*—This test method covers a procedure for determining creep resistance of insulated panels when loaded in flexure at ambient conditions.

11.2 *Significance*—The determination of the creep rate provides information on the behavior of insulated panel construction under constant load.

11.3 Size:

11.3.1 The panel shall be representative as to material and workmanship and shall be as large as practicable to minimize the effect of variations in the material and workmanship.

11.3.2 The length, width, and thickness of the panel shall be chosen to conform to the length or height of the panel in actual use.

11.3.3 The width of the specimen shall, insofar as possible, include several of the principal load carrying members such as stringers, ribs, etc., to ensure that the behavior under load will simulate that under service conditions. The nominal width for all specimens shall be the lesser of 1.2 m (4 ft) or full panel width.

11.3.4 Support conditions shall closely represent actual construction and the bearing area shall be the minimum area required by the manufacturer.

11.3.5 Panels constructed of materials, such as concrete and masonry (brick, structural clay tile, concrete block) for which the structural properties depend upon the age of the specimen, shall be tested not less than 25 days nor more than 31 days after fabrication. This age requirement also applies to plastered and stuccoed constructions. All other specimens shall age a minimum of 7 days prior to testing.

11.4 Loading:

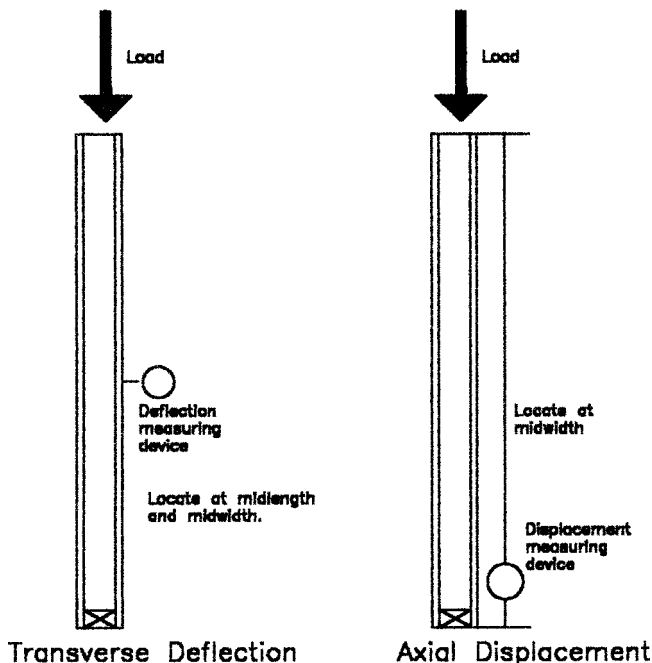


FIG. 1 Transverse Deflection and Axial Displacement