Designation: E1803 – 14

Standard Test Methods for Determining Strength Capacities of Structural Insulated Panels[1]

This standard is issued under the fixed designation E1803; 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 These test methods cover procedures for determining strength properties under specified loads for rigid-faced structural insulated panels. These test methods are appropriate for structural insulated panels with rigid facings having a minimum thickness of 0.16 in. (4 mm) and an insulating core with a minimum thickness of 1.5 in. (38 mm). These specified loads include:

1.1.1 Transverse loads,
1.1.2 Axial loads,
1.1.3 Shear loads,
1.1.4 Diaphragm loads,
1.1.5 Uplift loads,
1.1.6 Long Term loads
1.1.7 Impact loads, and
1.1.8 Concentrated loads.

1.2 Structural insulated panels are intended to resist structural loads 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 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.

1.7 *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:*[2]

D1037 Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
E72 Test Methods of Conducting Strength Tests of Panels for Building Construction
E455 Test Method for Static Load Testing of Framed Floor or Roof Diaphragm Constructions for Buildings
E575 Practice for Reporting Data from Structural Tests of Building Constructions, Elements, Connections, and Assemblies
E631 Terminology of Building Constructions
E695 Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading

3. Terminology

3.1 *Definitions*—For definitions of general terms related to building construction used in this test method, refer to Terminology E631.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *structural insulated panel (SIP), n*—a prefabricated assembly consisting of an insulating core laminated between two rigid facings suitable to resist structural loads in permanent building structures.

4. Summary of Test Methods

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

5. Significance and Use

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

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

Current edition approved March 1, 2014. Published March 2014. Originally approved in 1996. Last previous edition approved in 2006 as E1803 – 06. DOI: 10.1520/E1803-14.

[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.

TEST METHODS

6. Transverse Loads for Walls, Roofs, and Floors

6.1 SIPs shall be tested in accordance with Test Methods E72, 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 is determined.

7. Axial Loads for Walls

7.1 SIPs shall be tested in accordance with Test Methods E72, Section 9, with the following modifications:

7.2 Bearing conditions at the bottom of the SIP 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. Shear Loads for Walls

8.1 SIPs shall be tested in accordance with Test Methods E72, Section 14, with the following modifications:

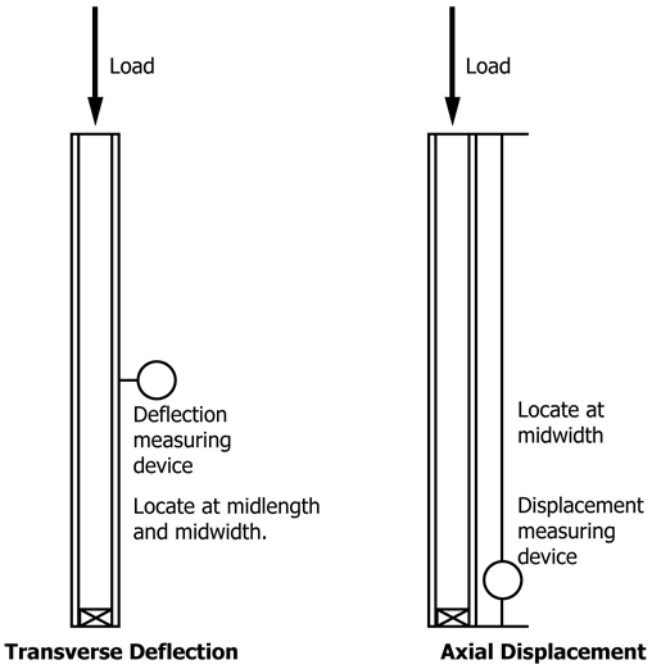

FIG. 1 Transverse Deflection and Axial Displacement

8.2 The SIP manufacturer's method for attaching the SIPs together and for attaching the SIPs to the top and bottom plates shall be followed. The SIPs shall not be 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 8 by 8 ft (2.4 by 2.4 m) consisting of a minimum of two 4 by 8 ft (1.2 by 2.4 m) SIPs.

8.3.2 Fasteners or adhesives, or both, as required by the manufacturer, shall be of the type and spacing intended for actual construction. Boundary members shall be installed per the manufacturer's requirements at the ends of SIP assembly. See Fig. 2.

9. Diaphragm Loads for Floors or Roofs

9.1 SIPs shall be tested in accordance with Test Method E455 with the following modifications:

9.2 *Cantilever Diaphragm and Simple Beam Diaphragm:*

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

9.2.1 Add to 6.1 of Test Method E455: the diaphragm shall contain not less than four individual elements.

9.2.2 Modify paragraph 9.2 of Test Method E455 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 SIPs 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 Panels

10.1 The SIPs and the manufacturer's recommended fastening system shall be tested in accordance with Test Methods D1037 for fastener head pull through. Section 15 of Test Methods D1037 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. Long-Term Loads for Roofs and Floors

11.1 *Introduction*—This test method covers a procedure for determining flexural creep resistance of SIPs.

11.2 *Significance*—The determination of the deflection under constant loads, or creep, provides information on the behavior of SIP construction over long time periods.

11.3 *Size:*

11.3.1 The SIP 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 SIP shall be chosen to conform to the length or height of the SIP 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