



Designation: E 2004 – 99

Standard Test Method for Facing Cleavage of Sandwich Panels¹

This standard is issued under the fixed designation E 2004; 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 test method covers the determination of the cleavage force to peel stiff facings from sandwich panels.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parenthesis may be approximate, and are for information only.

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

2. Referenced Documents

2.1 *ASTM Standards:*

D 1781 Test Method for Climbing Drum Peel for Adhesives²

E 4 Practices for Force Verification of Testing Machines³

3. Terminology

3.1 *Definitions:*

3.1.1 *adhesive failure*—failure that is completely within the adhesive layer with no evidence of interfacial disbonding between the core and the adhesive, between the adhesive and the facing, and no evidence of tearing or rupture within the core.

3.1.2 *bond failure*—failure that is interfacial and is either (a) between the adhesive and the core, or (b) between the adhesive and the facing; no core or adhesive failure will be in evidence in this type of failure.

3.1.2.1 *Discussion*—If bond failure occurs it should be specified as to whether it is type (a) or (b).

3.1.3 *core failure*—failure that is completely within the core material and is comprised of a tearing or rupture of the core material with no evidence of interfacial disbonding between the core and the adhesive, within the adhesive itself, or between the adhesive and the facing.

3.1.4 *mixed-mode failure*—failure that shows evidence of more than one of the three failure modes described above.

3.1.4.1 *Discussion*—Visually estimate and report the percent of the total failure surface area that is covered by each type of failure.

4. Significance and Use

4.1 This test method determines the cleavage force required to peel stiff facings from the core of sandwich panels, and is used to determine how well the facing is bonded to the core. Test Method D 1781 only works well with flexible facings. As a guideline, the cleavage test method would work better on sandwich panels that have facings with a bending stiffness (EI) of greater than approximately 27.3 lbs-in²/inch width (3.09 kN·mm²/mm width). This converts to approximately 0.032 in. (0.81 mm) aluminum, 0.023 in. (0.57 mm) steel, and 0.046 in. (1.18 mm) fiberglass facings.

5. Apparatus

5.1 *Test Machine*, capable of maintaining a controlled loading rate and indicating the load with an accuracy of $\pm 1\%$ of the indicated value. The accuracy of the test machine shall be verified in accordance with Practices E 4.

5.2 *Deflectometer*, capable of measuring the displacement with a precision of at least $\pm 10\%$.

5.3 *Micrometer gage or caliper*, capable of measuring accurately to 0.01 in. (0.25 mm).

6. Test Specimen

6.1 The test specimen shall be from the sandwich panel being evaluated.

6.2 Prepare the specimen according to the dimensions specified in Fig. 1.

6.3 The loading blocks shall be bonded to the specimen with an adhesive or attached with pop-rivets. See Fig. 2.

7. Conditioning

7.1 When the physical properties of the component materials are affected by moisture, bring the test specimens to constant weight ($\pm 1\%$) before testing, preferably in a conditioning room with temperature and humidity control, and

¹ This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.53 on Materials and Processes for Durable Rigidwall Relocatable Structures.

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² *Annual Book of ASTM Standards*, Vol 15.06.

³ *Annual Book of ASTM Standards*, Vol 03.01.