



Standard Test Method for Delamination Strength of Honeycomb Core Materials¹

This standard is issued under the fixed designation C 363; 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 delamination strength (tensile node-to-node bond strength) of honeycomb core materials.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound units given may be approximate.

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:*

E 4 Practices for Force Verification of Testing Machines²

3. Significance and Use

3.1 The honeycomb node bond strength is a fundamental property that can be used in determining whether honeycomb cores can be handled during cutting, machining and forming without the nodes breaking. The node bond strength is the tensile load that causes failure of the honeycomb by rupture of the bond between the nodes. It is usually a peeling-type failure.

3.2 This test method provides a standard method of obtaining honeycomb core node strength data for quality control, acceptance specification testing, and research and development.

4. Apparatus

4.1 *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.

4.2 *Grips*, of multiple-pin type.

4.3 *Micrometer, gage, or caliper*, capable of measuring accurately to 0.025 mm (0.001 in.).

5. Test Specimens

5.1 The test specimens shall be 130 mm (5 in.) wide by 260 mm (10 in.) long with a test section outside the grips of 200 mm (8 in.). The specimen width shall be parallel to the node bond areas. The thickness of the core slice shall be 12 mm (0.500 in.) for nonmetallic cores and 16 mm (0.625 in.) for metallic cores.

5.2 The number of test specimens and the method of their selection depend on the purpose of the particular test under consideration, and no general rule can be given to cover all cases. However, when specimens are to be used for acceptance tests, at least five specimens shall be tested, and these specimens shall be selected from that portion of the material which appears to have a maximum of distorted cells or misalignment of bond areas.

6. Conditioning

6.1 The test specimens may be subjected to any desired condition before testing. For example, immersion in boiling water or immersion in solvents.

7. Procedure

7.1 Measure the specimen dimensions to the nearest 0.25 mm (0.01 in.).

7.2 Select pins with the largest diameters that will easily fit into the honeycomb cells.

7.3 Place the pins in cell rows in the top and bottom portions of the specimen.

7.4 Fig. 1 shows a fixture that has been satisfactorily used to hold and load the pins.

7.5 Load the specimen at a constant cross-head movement of 25 mm/min. (1 in./min.).

7.6 Failure of the core at the pin location is not considered a valid test. A retest shall be performed.

8. Calculation

8.1 Calculate the delamination strength (node-to-node bond strength) of the core material as follows:

$$\sigma = \frac{P}{bt} \quad (1)$$

¹ This test method is under the jurisdiction of ASTM Committee D-30 on Composite Materials and is the direct responsibility of Subcommittee D30.09 on Sandwich Construction.

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² *Annual Book of ASTM Standards*, Vol 03.01.

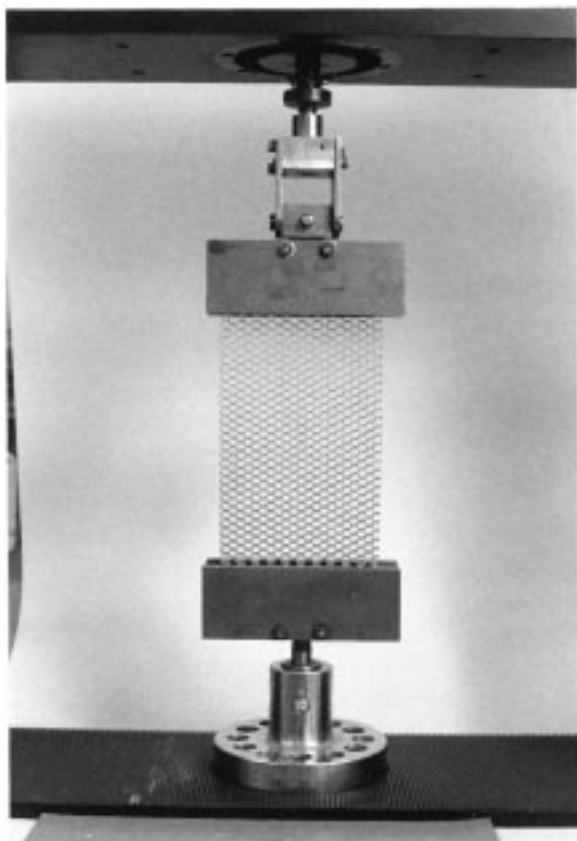


FIG. 1 Honeycomb Core Delamination Test Setup

where:

σ = delamination strength, MPa (psi);

P = ultimate tensile load, N (lb);
 b = initial width of specimen, mm (in.); and
 t = thickness of specimen, mm (in.)

9. Report

9.1 The report shall include the following:

- 9.1.1 Description of core material; cell size, density, and type,
- 9.1.2 Dimensions of the test specimen,
- 9.1.3 Any special treatment of core before test such as boiling water, and so forth,
- 9.1.4 Test temperature and specimen time at temperature,
- 9.1.5 Test machine cross-head loading rate,
- 9.1.6 Delamination strength; individual values and average, and
- 9.1.7 Description of failure mode, and where the failure occurred.

10. Precision and Bias

10.1 *Precision*—The precision of the procedure in Test Method C 363 for measuring the honeycomb core material delamination strength is not available.

10.2 *Bias*—Since there is no accepted reference material suitable for determining the bias for the procedure in this test method, bias has not been determined.

11. Keywords

11.1 delamination strength; honeycomb core; node bond strength

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