



Designation: C 271 – 99

## Standard Test Method for Density of Sandwich Core Materials<sup>1</sup>

This standard is issued under the fixed designation C 271; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers the determination of the density of sandwich construction 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 171 Specification for Standard Atmospheres for Conditioning and Testing Flexible Barrier Materials<sup>2</sup>

### 3. Significance and Use

3.1 Density is a fundamental physical property that can be used in conjunction with other properties to characterize the sandwich core.

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

### 4. Apparatus

4.1 *Circulating Air Oven*, capable of maintaining uniform temperatures with an accuracy of  $\pm 3^\circ\text{C}$  ( $\pm 5^\circ\text{F}$ ).

4.2 *Desiccator*, if required.

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

4.4 *Weighing Scale*, capable of measuring accurately to  $\pm 0.5\%$ .

### 5. Test Specimens

5.1 The test specimens may be any convenient size of core material that can be accurately measured and as agreed upon by

the purchaser and the seller. The minimum specimen size recommended is 300 mm (12 in.) in length and 300 mm (12 in.) in width.

5.2 At least three specimens shall be tested.

### 6. Conditioning

6.1 Subject the test specimens to one of the following conditions:

6.1.1 Standard ASTM Atmospheric Conditions (Specification E 171) of  $23 \pm 3^\circ\text{C}$  ( $73 \pm 5^\circ\text{F}$ ) and  $50 \pm 5\%$  relative humidity.

6.1.2 In an oven at a temperature of  $105 \pm 3^\circ\text{C}$  ( $220 \pm 5^\circ\text{F}$ ).

6.1.3 In an oven at a temperature of  $40 \pm 3^\circ\text{C}$  ( $120 \pm 5^\circ\text{F}$ ).

6.1.4 As agreed upon by the purchaser and the seller.

6.2 The conditioning time shall be either:

6.2.1 Of such duration that the specimen will have attained constant weight ( $\pm 1\%$ ), or

6.2.2 As agreed upon by the purchaser and the seller.

6.3 After conditioning, cool the specimens at room temperature. Some core materials quickly pick up moisture and must be cooled in a desiccator.

### 7. Procedure

7.1 Weigh the specimens in grams (pounds) to a precision of  $\pm 0.5\%$ .

7.2 Determine the plan dimensions of the specimens in millimetres (inches) to a precision of  $\pm 0.5\%$ .

7.3 Measure the thickness of the specimens in millimetres (inches) to the nearest 0.025 mm (0.001 in.).

### 8. Calculation

8.1 Calculate the density as follows:

$$d = \frac{1\,000\,000\,w}{v} \quad (1)$$

where:

$d$  = density,  $\text{kg}/\text{m}^3$ ;

$w$  = final mass after conditioning, g;

$v$  = final volume after conditioning,  $\text{mm}^3$ ;

or

$$D = \frac{1728\,W}{V} \quad (2)$$

<sup>1</sup> 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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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.09.