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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Dimensions and Density of Preformed Block and Board–Type Thermal Insulation[1]

This standard is issued under the fixed designation C 303; 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 determination of the dimensions and density of block and board insulation as defined in Terminology C 168.

1.2 The values stated in the SI system are to be regarded as the standard.

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:*

C 167 Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations[2]

C 168 Terminology Relating to Thermal Insulating Materials[2]

C 390 Criteria for Sampling and Acceptance of Preformed Thermal Insulation Lots[2]

C 870 Practice for Conditioning of Thermal Insulating Materials[2]

3. Terminology

3.1 *General*—Terminology C 168 shall be considered as applicable to the terms used in this test method.

4. Summary of Test Method

4.1 The material may either be tested in the "dry" condition or in the "as manufactured and received" condition (see Note 1) but the procedure must be consistent with that as given in the material specification. If the material is to be tested in the "dry" condition it shall be dried to constant mass. If the material specification does not give conditioning instructions, a conditioning environment of 23°C ± 2°C and 50 ± 5 % relative humidity per Practice C 870 shall be used. From the measured mass and measured dimensions, the density of the product is calculated.

NOTE 1—Some materials may contain volatiles such as moisture when manufactured or shipped, or both.

5. Significance and Use

5.1 Dimensional measurements of the product thermal insulation are essential in determining compliance of a product with specification limits. Dimensional measurements of various test specimens are also required by the specific test method.

5.2 Density measurements of the product insulation are useful in determining compliance of a product with specification limits, and in providing a relative gage of product weights. For any one kind of insulation, some important physical and mechanical properties, such as thermal conductivity, heat capacity, strength, etc., bear a specific relationship with its density; however, on a density basis, these properties may not be directly comparable with those for other kinds of material. In order to design for equipment supports it may be desirable to check the material for the "as received density" where the moisture content of the product as received and then installed may consequential.

6. Apparatus

6.1 *Steel measure*, (ruler or tape), graduated in millimetres or better, suitable for measuring dimensions to ± 1.0 % (see Note 2).

6.2 *Instrument*, such as caliper, dial gage, or micrometer graduated in millimetres or better, with a minimum plate diameter of 6 mm, and a maximum plate of 25 by 25 mm. This instrument shall be suitable for measuring the dimensions to ±1.0 %. This instrument shall not cause deformation of the product when measuring it. The pressure exerted by this measuring plate should not exceed 0.245 kN/mm^2.

6.3 Pin probe depth gage per Test Methods C 167.

6.4 *Scales*, accurate to within 5 g or within 1 % of the specimen mass (whichever is less). If the material specification calls for a greater accuracy, this would take precedence. If the samples are to be conditioned per Practice C 870 the accuracy shall be within 0.1 %.

6.5 *Drying Oven*.

NOTE 2—Generally a rule or instrument is used for dimensions less

[1] This test method is under the jurisdiction of ASTM Committee C–16 on Thermal Insulation and is the direct responsibility of Subcommittee C 16.32 on Mechanical Properties.

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[2] *Annual Book of ASTM Standards*, Vol 04.06.

than a metre and a tape used for longer dimensions.

7. Test Specimen

7.1 The test specimens shall be of commercial size whenever practicable, but shall not be less than 100 mm wide by 200 mm long, except if required by a specific test method. The sample size shall be determined in accordance with the material specification. If not specified there, then in accordance with Criteria C 390 test at least five specimens.

7.2 When less than full commercial size pieces are tested ends and sides shall be trimmed by cutting or fabricating to give a block with parallel sides and ends with only top and bottom surfaces original.

8. Conditioning

8.1 If the specimens are to be conditioned, condition the specimens to constant mass in accordance with Practice C 870. Consult the materials specification for any specific conditioning requirements.

8.2 If the specimens are not to be conditioned, test as soon as possible.

9. Procedure

9.1 After conditioning, measure the width and length of the specimen to the nearest 1 mm unless different tolerances are given in the material specification, or there are different measurement tolerances within a specific test method to be applied.

9.2 If the pin probe depth gage is used the measurements shall be per 8.2 of Test Methods C 167.

9.3 The thickness shall be measured along the edges in at least four different locations, generally near the four corners approximately 25-75 mm from the corner, as shown in Fig. 1 for locations A,B,C, and D. The length and width should be measured in at least two locations. At approximately along the A-B and C-D lines for the width and the A-D and B-C lines for the length. For specimens larger than 1 m^2 in area, there should be an additional two thickness measurements for each additional square meter in size. These would be in the central section of the specimen as shown by locations E and F. There should also be an additional length or width measurement for each additional meter increase in length or width over 1 m long. These measurement positions should be spaced approximately equally within the original measurement area defined by A,B,C,D.

9.4 Measure and record the mass.

10. Calculation

10.1 Calculate the volume of the specimen from the average width, length, and thickness as follows:

$$\text{Volume, } m^3 = \text{length, mm} \times \text{width, mm} \times \text{thickness, mm} \times 10^{-9} \quad (1)$$

10.2 Calculate the density of the specimen from the mass and calculated volume as follows:

$$\text{Density, kg/m}^3 = \frac{\text{mass, kg}}{\text{volume, m}^3} \quad (2)$$

$$\text{density, lb/ft}^3 = \text{density, kg/m}^3 \times 0.06243 \quad (3)$$

11. Report

11.1 Report the average density of the sample in kilograms per cubic metre or pounds per cubic foot. Report density to three significant figures.

11.2 Report the dimensions. Report dimensions to the nearest millimeter, or as requested.

11.3 Material identification including manufacturers type/grade designation and lot number or date of manufacture.

11.4 Date testing was performed.

11.5 Specimen conditioning used or “tested as received.”

12. Precision and Bias

12.1 The precision of this test method is not known because interlaboratory data are not available. This test method may not be suitable for use in specifications or in case of disputed results as long as these data are not available.

13. Keywords

13.1 block; board; density; dimensions; thermal insulation; thermal insulating materials–block and board

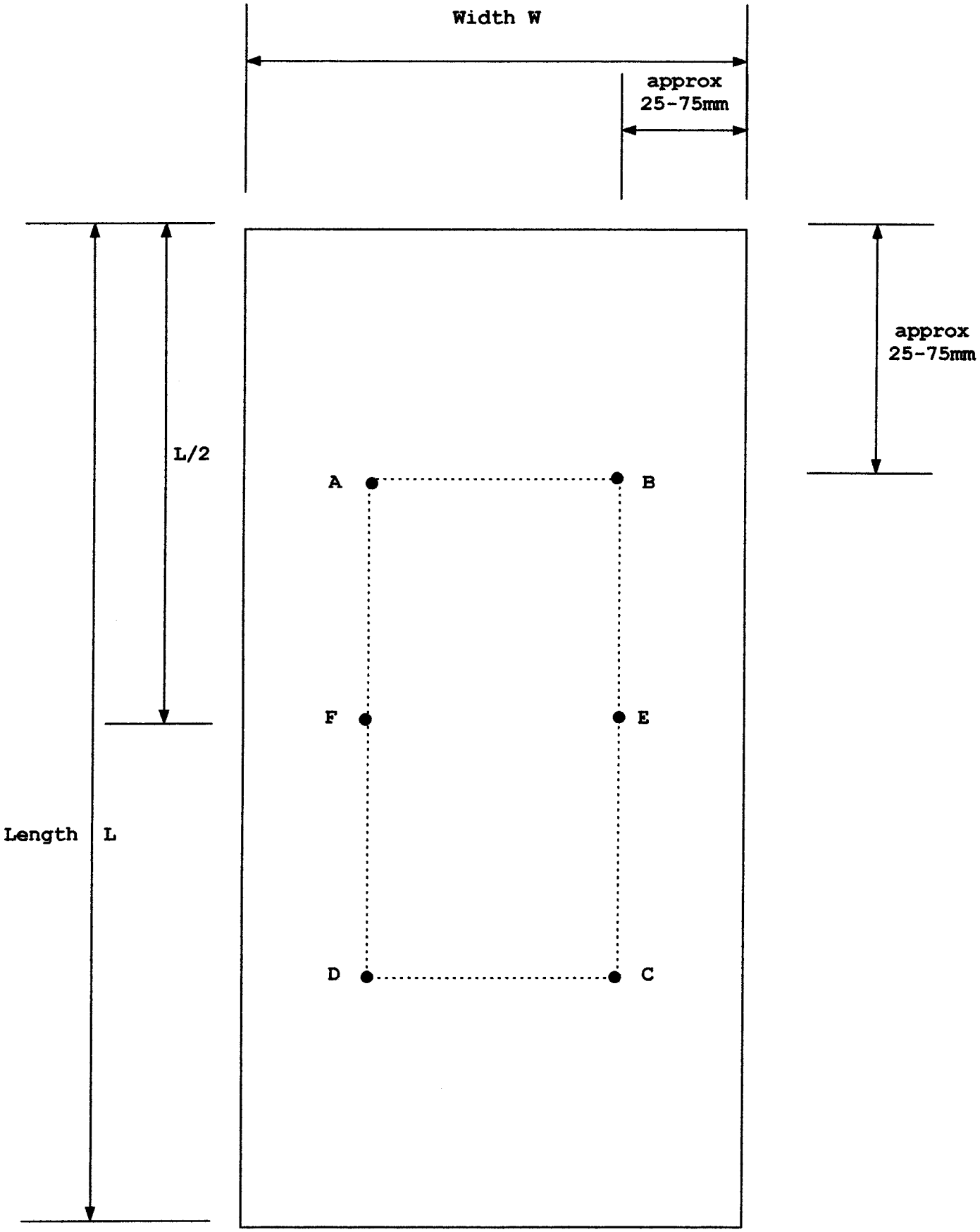

FIG. 1 Specimen Measurement