



Designation: D3014 – 04a

Standard Test Method for Flame Height, Time of Burning, and Loss of Mass of Rigid Thermoset Cellular Plastics in a Vertical Position¹

This standard is issued under the fixed designation D3014; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This is a fire-test-response standard. This test method covers a small-scale laboratory screening procedure for comparing relative extent and time of burning and loss of mass of rigid thermoset cellular plastics. This test method is to be used solely to establish relative burning characteristics and shall not be considered or used as a fire-hazard classification.

1.1.1 This test method should not be used for materials that drip or melt under the test conditions.

1.2 During the course of combustion, gases or vapors, or both, are evolved which are potentially hazardous to personnel. Adequate precautions should be taken to protect the operator.

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.* A specific precautionary statement is given in 1.2.

1.4 *This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of materials, products, or assemblies under actual fire conditions.*

NOTE 1—There is no similar or equivalent ISO standard.

2. Referenced Documents

2.1 *ASTM Standards:*²

[D883 Terminology Relating to Plastics](#)

[D1622 Test Method for Apparent Density of Rigid Cellular Plastics](#)

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.30 on Thermal Properties (Section D20.30.03).

Current edition approved July 1, 2004. Published July 2004. Originally approved in 1973. Last previous edition approved in 2004 as D3014 - 04. DOI: 10.1520/D3014-04A.

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.

[D5025 Specification for Laboratory Burner Used for Small-Scale Burning Tests on Plastic Materials](#)

[E176 Terminology of Fire Standards](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

3. Terminology

3.1 *Definitions*—For terms relating to plastics, the definitions in this test method are in accordance with Terminology [D883](#). For terms relating to fire, the definitions in this test method are in accordance with Terminology [E176](#).

4. Summary of Test Method

4.1 The specimen is mounted in a vertical chimney with a glass front and ignited with a bunsen burner for 10 s. The height and duration of flame and the mass percent retained by the specimen are recorded.

5. Significance and Use

5.1 Tests made on rigid cellular materials in accordance with the conditions described by this test method can be of considerable value in comparing their burning characteristics. The height and duration of flame and the mass percent retained by the specimen are recorded.

5.2 This test method has been applied to flexible cellular materials and other plastics, but no detailed studies have been conducted to determine its general applicability to these materials.

5.3 In this procedure, the specimens are subjected to one or more specific sets of laboratory test conditions. If different test conditions are substituted or the end-use conditions are changed, it may not be possible by or from this test to predict changes in the fire-test-response characteristics measured. The results are therefore valid only for the fire-test-exposure conditions described in this procedure.

6. Apparatus

6.1 *Test Chimney*, conforming to the dimensions in [Fig. 1](#), [Fig. 2](#), and [Fig. 3](#). The body of the chimney may be either galvanized or stainless steel. In it is fastened an insert made of 0.025-mm aluminum foil. The insert is held in place by a stainless steel channel that carries three pins to support the

*A Summary of Changes section appears at the end of this standard.

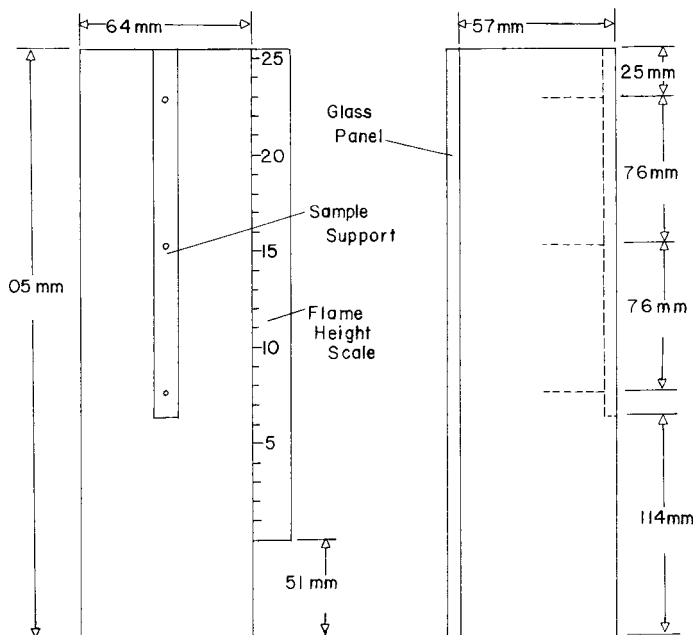


FIG. 1 Critical Dimensions of Chimney

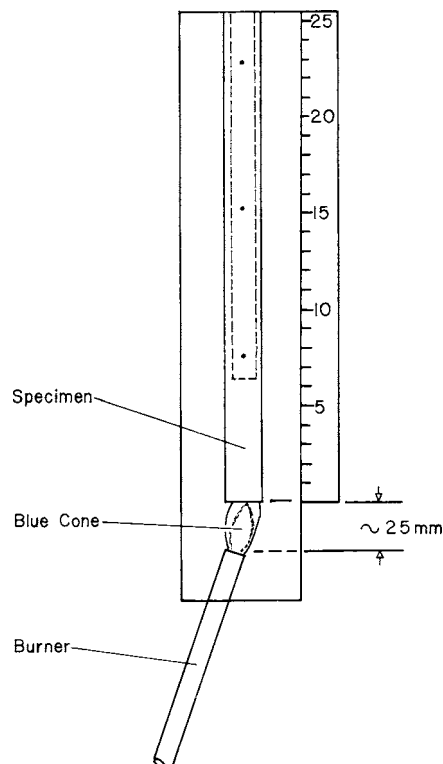


FIG. 4 Burner Position Under Specimen in Chimney (Front View)

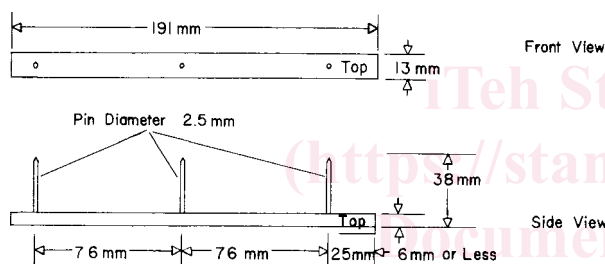


FIG. 2 Critical Dimensions of Specimen Support

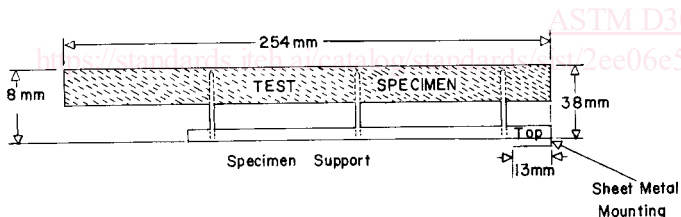


FIG. 3 Test Specimen Impaled on Specimen Support (Side View)

specimen. A heat-resistant glass panel forms the front wall of the chimney. A scale, in millimetres, graduated at 10-mm intervals shall be provided at one side of the glass panel for determining flame height (see Fig. 1 and Fig. 4). The scale shall begin 51 mm above the bottom of the chimney.

6.2 *Timer*, capable of measuring to the nearest 0.1 s for determining the duration of burning.

6.3 *Burner*—A standard gas burner with a 9.5-mm inside diameter barrel capable of producing a flame with an inner cone of 960°C is required to ignite the specimens. See Specification D5025 for burner construction.

6.4 *Balance*, capable of weighing to the nearest 0.01 g for weighing the specimen.

6.5 *Test Chamber*—A relatively draft-free laboratory hood. The fan shall be off during the test, but turned on immediately following the test to remove products of combustion.

7. Test Specimens

7.1 Cut six specimens from material of uniform density. The specimens shall be 254 by 19 by 19 mm and shall be free of dust, and the cut edges shall be smooth. If any specimen varies by more than 5 % from the average density of the six (see 9.1), the sample shall be considered unacceptable for testing by this test method.

8. Conditioning

8.1 Condition the specimens a minimum of 24 h at atmospheric conditions of $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity.

8.2 The specimens shall remain in the temperature- and humidity-controlled atmosphere until immediately before testing.

9. Procedure

9.1 Determine the density of each specimen in accordance with Test Method D1622.

9.2 Weigh and record the mass (M) of each specimen to the nearest 0.01 g.

9.3 Weigh and record the mass (S_1) of the specimen support to the nearest 0.01 g.

9.4 Ignite and adjust the burner so that the inner blue cone is 25 to 35 mm high. Further adjust the burner until the temperature at the top of the inner cone is $960 \pm 5^\circ\text{C}$.

NOTE 2—To obtain 960°C, it will be necessary to use a propane burner with propane gas, or a natural-gas burner with natural gas. In order to minimize the time and frequency required for temperature calibration, it is necessary to maintain a steady supply of gas. Thermocouples have been found useful to make this temperature measurement.