**Designation: ~~D3014 – 18~~ D3014 – 19**

# Standard Test Method for Flame Height, Time of Burning, and Loss of Mass of Rigid Thermoset Cellular Plastics in a Vertical Position[1]

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.

## 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.~~characteristics.

1.1.1 This test method shall 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 shall 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, health, and environmental 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.*

1.5 *Fire testing is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests.*

NOTE 1—There is no known ISO equivalent to this standard.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*



## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

D883 Terminology Relating to Plastics

D1622 Test Method for Apparent Density of Rigid Cellular Plastics

D5025 Specification for Laboratory Burner Used for Small-Scale Burning Tests on Plastic Materials

E176 Terminology of Fire Standards

E456 Terminology Relating to Quality and Statistics

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E2935 Practice for Conducting Equivalence Testing in Laboratory Applications

2.2 *ISO Standard:*[3]

ISO 13943 Fire Safety—Vocabulary

## 3. Terminology

3.1 *Definitions*—For definitions of 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 and

[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

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[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.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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

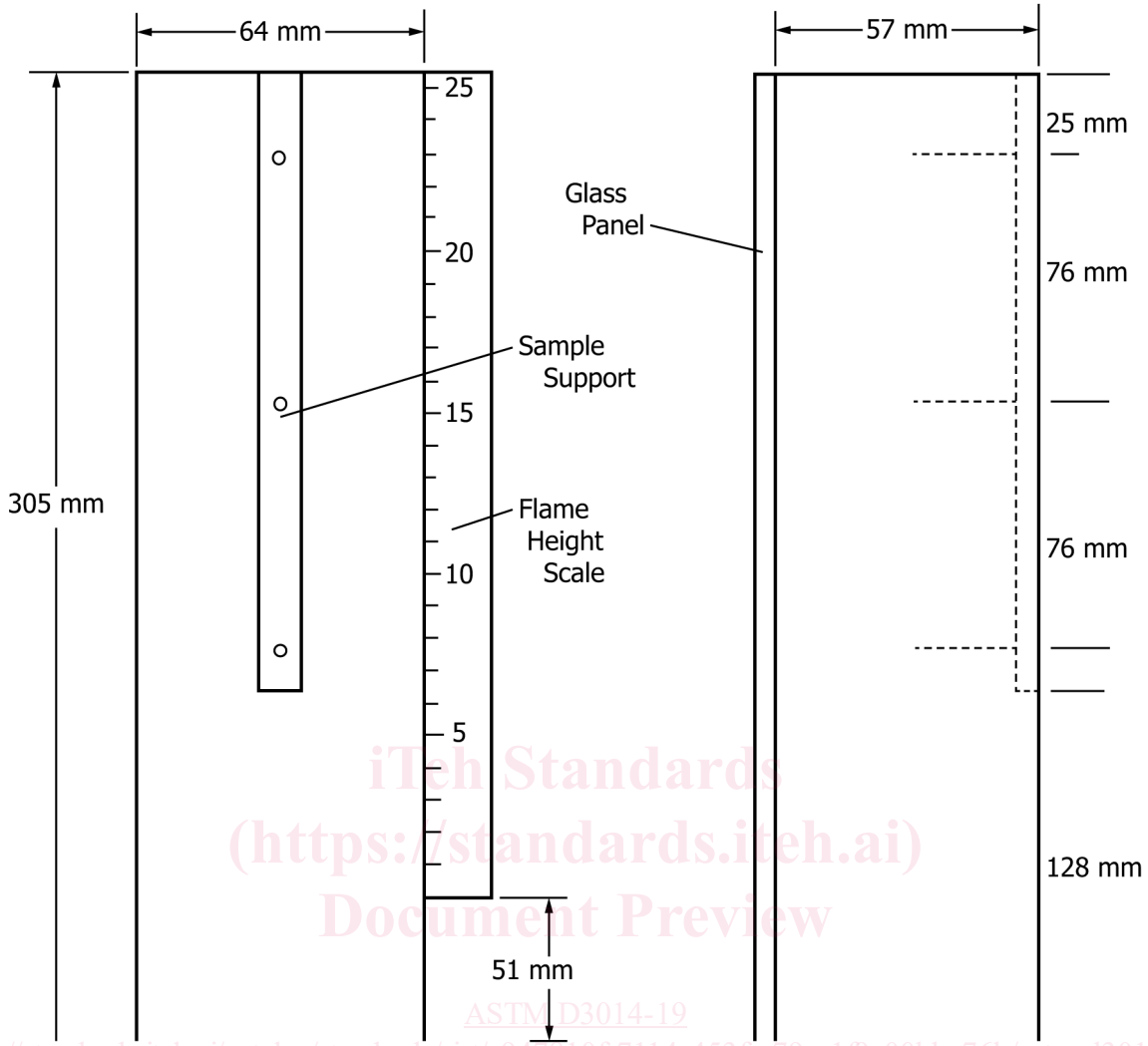




**FIG. 1 Critical Dimensions of Chimney**

ISO 13943. In case of conflict, the definitions given in Terminology E176 shall prevail. For terms relating to precision and bias and associated issues, the terms used in this test method are in accordance with the definitions in Terminology E456.

## 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.

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 is not always 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. The body of the chimney shall be made of non-corroding metal. Fastened into the chimney is an insert made of 0.025-mm thick aluminum foil. The insert shall be held in place by a stainless steel channel that carries three pins to support the specimen. A heat-resistant glass panel forms the front wall of the chimney (see Figs.

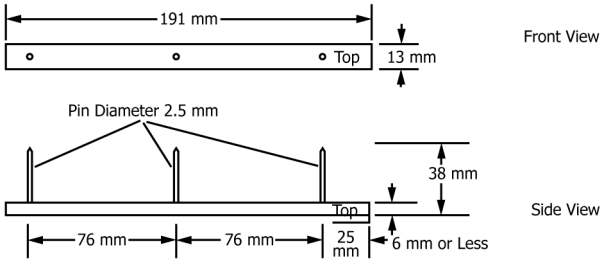


**FIG. 2 Critical Dimensions of Specimen Support**

2 and 3). A scale, in millimeters, 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 from a height of 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 temperature of 960 ± 5°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 switched off during the test, but turned on immediately following the test to remove products of combustion.

## 7. Test Specimens

7.1 Six specimens shall be cut from a material of uniform density. The specimens shall be 254 ± 1 mm by 19 ± 0.5 mm by 19 ± 0.5 mm and shall be free of dust, and the cut edges shall be smooth.

7.2 If any single specimen varies by more than 20 % from the average density of the six specimens (see 9.1), the sample shall be considered unacceptable for testing by this test method.



## 8. Conditioning

8.1 Condition the specimens for a minimum of 24 h at a temperature of 23 ± 2°C and a relative humidity of 50 ± 10 %.

8.2 The specimens shall remain in the temperature- and humidity-controlled atmosphere until immediately prior to testing. For convenience, the specimens can be stored up to 1 h in closed polyethylene bags after conditioning and prior to 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 ± 5°C.

NOTE 2—To obtain 960°C, it will be necessary to use a burner with propane gas, or 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.

9.5 Impale the specimen on the three pins of the specimen support, with the top of the specimen even with the top of the specimen support as shown in Fig. 3. It is possible that high-density cellular plastics will require holes to be drilled in the specimen to allow insertion of the pins. When required, the holes must be drilled at the time of specimen preparation. (If holes are drilled, the specimen shall be weighed after drilling, see 9.2.)

9.6 Line the chimney with aluminum foil so that it is against the sides and back of the chimney and flush with the bottom. Place the shiny side of the aluminum foil towards the test specimen. A new liner shall be installed for each specimen.

9.7 Place the specimen support in the chimney so that the top of the specimen is even with the top of the chimney, as shown in Fig. 4.

9.8 Put the glass front in place and ignite the specimen by placing the inner cone of the burner flame under the center of the specimen for 10 s. Simultaneous with placing the flame under the specimen, start the timer to determine the time to extinguishment ($T_e$). Keep the burner at an angle of about 15° from the vertical as shown in Fig. 4.

NOTE 3—Accurate positioning of the burner is facilitated by use of a cradle to hold the burner at the proper angle and distance from the specimen.