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Standard Specification for Fire Safety for Candle Accessories¹

This standard is issued under the fixed designation F 2601; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification prescribes minimum safety requirements for candle accessories to help ensure a reasonable degree of safety for normal use with candles, thereby improving personal safety and reducing fires, deaths, and injuries.

1.2 This specification is not intended to replace other safety practices such as adult supervision, close monitoring of product when in use, and fire detection, alarm, or suppression systems.

~~1.3 Candles burn with an open flame. Precautions must be taken to ensure that the flame does not ignite combustible materials and initiate a larger fire. To that end, this specification establishes minimum safety requirements for candle accessories.~~

~~1.4~~

~~1.3~~ The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

~~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 the materials, products, or assemblies under actual fire conditions.~~

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~~1.6 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:~~ ASTM Standards:²

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester

E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750C

E 176 Terminology of Fire Standards

F 1972 Guide for Terminology Relating to Candles and Associated Accessory Items F2058 Specification for Candle Fire Safety Labeling

F 2417 Specification for Fire Safety for Candles

~~2.2 ANSI Standard:~~

ANSI Z535.4-2002 Product Safety Signs and Labels

~~2.3 Federal Standard:~~

16CFR1500 Hazardous Substances and Articles; Administration and Enforcement Regulations

3. Terminology

3.1 *Definitions*— Certain candle-related terminology has already been addressed in Guide F 1972. Certain additional fire-related terminology is found in Terminology E 176. The reader is directed to those standards for definitions not found in 3.2.

3.2 *Definitions of Terms Specific to This Standard:*

3.3 *burn time, n*—total length of time from which the flame propagates away from the ignition source until it goes out on its own.—time interval a test specimen supports sustained flaming combustion after removal of the ignition source until all flaming ceases.

3.4 *candle accessory, n*—object designed, intended, or marketed for use with a candle.

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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.

3.5 *candle burner, n*—~~device—candle holder~~ that has an enclosed, but vented, area in which to put a candle, said candle providing a source of heat or light or both.

3.6 *candle ring*~~candle holder, n~~—~~type of candle accessory intended to surround the candle with decorative materials in proximity to a candle, excluding containers and holders.~~—~~candle accessory onto which a candle is placed. It may support, hold or contain a candle when in use.~~

3.6.1 *Discussion*—Filled candles are not candle holders.

3.7 *candle ring, n*—~~candle accessory intended to surround the candle with decorative materials in proximity to a candle, including, but not limited to, a continuous ring or loose fill material.~~

3.8 *consumption rate, n*—rate at which a candle is consumed measured in grams of fuel consumed per hour.

3.8.1 *Discussion*—Consumption rate is determined by weighing a candle prior to burning and then again at the end of the life or burn cycle of the candle. The weight consumed in grams is then divided by the burn time in hours to arrive at a consumption rate in grams per hour.

3.9 *ignition, n*—initiation of combustion.

3.7.1

3.9.1 *Discussion*—The combustion is typically evidenced by glow or flame. The combustion may be sustained or transient.

3.8

3.10 *noncombustible, adj*—~~refers to a material that, in the form in which it is used and under the conditions anticipated, does not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.~~

3.8.1—~~not capable of igniting and burning when subjected to a fire under specified conditions.~~

3.10.1 *Discussion*—Materials that are reported as passing Test Method E136 are considered noncombustible materials.

3.9—~~Materials that pass Test Method E 136 are considered noncombustible.~~

3.11 *potpourri burner, n*—candle burner designed to provide a source of heat to warm a reservoir of extraneous material.

3.12 *sustained flaming, n*—existence of flame on or over the surface of the specimen for periods of 4 s or more.

3.12.1 *Discussion*—Sustained flaming starts at the beginning of the period when a flame is found on or over the surface.

4. Safety Requirements

4.1 ~~This safety requirement applies to all candle rings with the following exceptions: rings constructed exclusively of noncombustible materials, rings constructed exclusively of live plants or fresh cut flowers, or both, that remain hydrated during their intended life, or items including rings that incorporate barrier technology (see 5.2.4.12-5.2.4.14). Class α is the designation given to candle rings that pass the flammability requirements for candle rings (4.1.2.1). Class β is the designation given to candle rings that do not pass the flammability requirements for candle rings. Class β rings are intended for use with candle systems that provide a barrier designed to keep the candle flame from coming in contact with the candle ring. Class β rings shall carry a safety label affixed to the product. The Class β label shall be visible at the point of sale (4.1.2.2~~

4.1 *Safety Requirements for Candle Rings*—~~This safety requirement applies to all candle rings with the following exceptions: rings constructed exclusively of noncombustible materials, rings constructed exclusively of live plants or fresh cut flowers, or both, that remain hydrated during their intended life, or items which include rings that incorporate barrier technology (see 5.2.4.14-5.2.4.16).~~

4.1.1 *Rationale:*

4.1.1.1 Candle rings are used in proximity to a known source of ignition (candle flame).

4.1.1.2 Flammable components of candle rings increase the risk of fires when using candle products.

4.1.1.3 ~~Some candle rings have difficulty meeting the flammability requirements for candle rings because of the technical problems in developing complying products. These flammable products, designated Class β , will require a label to alert the consumer at point of purchase of the flammability potential of the product. (See Note 1.)~~

4.1.2 *Performance Requirement:*

4.1.2.1 ~~A candle ring, designated as Class α , shall pass the flammability requirements for candle rings if, when tested according to~~

4.1.2.1 A candle ring shall pass the flammability requirements for candle rings if, when tested according to 5.2, it does not ignite or has a burn time less than or equal to an average of 30 s before extinguishing when testing three samples per component. The maximum allowable burn time to extinguish for any one test shall not exceed 60 s. During the test, flaming shall not spread over the entire sample.

4.1.2.2 ~~A candle ring designated as Class β (one that is intended for use with candle systems that provide a barrier designed to keep the candle flame from coming in contact with the candle ring but that fails to comply with the requirement detailed in 4.1.2.1) shall have a conspicuous label attached that shall contain the language in Fig. 1.~~

4.1.2.3 ~~The label shall contain a safety alert symbol which is a black triangle with a black exclamation point. The signal word “warning” shall follow the safety alert symbol and will be all uppercase, black text with an orange background. The word message shall contain the word flammable in all uppercase text with the warning immediately following. The warning text size shall be at least 10-point font. A sans serif font, such as Arial or Helvetica, shall be used. The label shall be prominently displayed and securely attached to the product. If there are outer wrappings, the warning shall also exist on the outer wrappings. Further recommendations on the prescribed format are found in ANSI Z535.4 2002. Additional information is found in CFR161500 which contains~~

~~prominences, placements, and conspicuousness labeling requirements~~, it does not ignite or has a burn time less than or equal to an average of 30 s for three tests per component and the burn time for any one test shall not exceed 60 s. During any test, flaming shall not spread over the entire candle ring. The test shall be conducted on all applicable components of the ring.

4.2 Safety Requirements for Candle Holders—This safety requirement applies to all candle holders, including candle burners and potpourri burners, with the following exceptions: holders constructed exclusively of noncombustible materials (see Note 1) or which incorporate barrier technology. (See 5.2.4.15.)

NOTE 1—It is the intent of Subcommittee F15.45 to review this standard within one year of the date of publication in relation to the permissibility of the labeling option for class β rings.

~~4.2 Safety Requirements for Stability~~—This safety requirement applies to all accessories intended to be used in direct contact with burning candles. 1—Observations indicate that some porous materials which are otherwise considered to be noncombustible, for example, unglazed ceramics and terra cotta, absorb molten wax or other combustible liquids and can support sustained flaming combustion. This note has been provided for informational purposes only.

4.2.1 Rationale—This requirement minimizes the hazards of candle accessory/ensemble tip over.:

4.2.1.1 Candle holders are used with burning candles placed directly on or in them.

4.2.1.2 Direct flame impingement of the candle flame onto candle holders is possible during use, resulting in the candle holder igniting.

4.2.2 Performance Requirement—The candle accessory must not tip over when placed at a minimum 10.0° incline when tested with the candle specified in 5.3.3.1(1) through 5.3.3.1 (2).—A candle holder shall pass the flammability requirements for candle holders if, when tested according to 5.2, it does not ignite or has a burn time less than or equal to an average of 30 s for three tests per component and the burn time for any one test shall not exceed 60 s. During any test, flaming shall not spread over the entire candle holder. The test shall be conducted on all applicable components of the holder.

~~4.3 Safety Requirements for Candle Burners and Potpourri Burners~~—This safety requirement applies to potpourri burners, ceramic burners, and any other type of burner designed to use a candle as a source of heat or light or both.—This safety requirement applies to all types of burners designed to use a candle as a source of heat or light, or both. Candle burners and potpourri burners are also subject to the requirements of 4.2.

4.3.1 Rationale:

4.3.1.1 Candle burners and potpourri burners can contribute to secondary ignition, excessive flame heights, or end of useful life problems, or all a combination thereof. These are often associated with the buildup of heat or soot or both from candles placed in these types of products.

4.3.1.2 Candle burners and potpourri burners meeting the performance requirement listed in 4.3.2 will reduce the risk of fires initiated by candles used with these types of products.

4.3.2 Performance Requirement:

~~4.3.2.1 A candle burner or potpourri burner shall pass the performance requirements if there is no secondary ignition, excessive flame height, or end-of-useful life problems as detailed in Specification F2417 when the candle burner is tested with a scented tealight (or other specified or supplied candle) according to the candle burning performance test method found in the Candle Burning Performance Test section of Specification F2417~~

4.3.2.1 A candle burner or potpourri burner shall pass the performance requirements if there is no secondary ignition, excessive flame height, or end-of-useful life problems as detailed in Sections 4.1 through 4.3 in Specification F 2417 and the burner does not ignite, crack, or break when the candle burner is tested with an appropriate scented tealight (or other supplied candle meeting the requirements in 5.3.1) according to the candle burning performance test method found in Section 5.2.4 of Specification F 2417.

4.3.2.2 A minimum of three identical samples shall be tested eight times each with no failures allowed.

NOTE 2—Research³ indicates that items with a small internal volume, low ceiling height, and limited ventilation are especially at risk to fail the flame height, end-of-useful life, and secondary ignition requirements of Specification F 2417.

4.4 Safety Requirements for Stability— This safety requirement applies to all accessories intended to be used in direct contact with burning candles.

4.4.1 Rationale—This requirement minimizes the hazards of candle accessory/ensemble tip over.

4.4.2 Performance Requirement—The candle accessory must not tip over when placed at a minimum 10.0° incline when tested with the candle specified in 5.3.1.

5. Test Methods

5.1 Candle fire safety issues addressed by these test methods include candle ring and holder flammability, candle burner and potpourri burner accessories burn performance and stability.

5.2 ~~Flammability of Candle Rings~~ Flammability of Candle Rings or Holders:

² Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

³ “Consumer Safety Research—Fires Associated With the Use of Night Lights and Ceramic Burners,” July 1996, Fire Research Station, Building Research Establishment. (Research conducted on behalf of the Consumer Safety Unit of the Department of Trade and Industry.) Consumer Safety Unit, 1 Victoria Street, London SW1H 0ET.

5.2.1 *Summary of Test Method*—Components of candle rings or holders are tested on a flat noncombustible surface for sustained ignition. ~~flaming combustion.~~ Components of the ring or holder are tested for flammability through contact with the flame source for up to 60 s. Each test is monitored for sustained ~~ignition—flaming combustion~~ of the component. Three separate tests are performed on each type of component. ~~The time for component of the candle ring or the sample to extinguish candle holder. The burn time~~ is measured.

5.2.2 Apparatus:

5.2.2.1 Large, flat, noncombustible surface.

5.2.2.2 *Flame Source*— A butane diffusion flame intended to represent a candle flame. The burner tube consists of a stainless steel tube with an outside diameter of approximately 8.0 mm (nominally 8 mm) and a wall thickness of ± 0.1 mm. The gas supply system consists of a pressure gauge, flow meter, fine-control valve, and cylinder regulator providing an outlet pressure of 28.5 mbar (0.4 psi). The flow meter supplies butane gas at a constant rate of 45 mL/min at 25°C. Under the specified conditions, the flame height is approximately 35 mm.

NOTE 3—Alternative flame sources can be used if the heat flux of the flame is 130 to 170 kW/m² and the flame temperature is at least 560°C. 3—An alternative flame source is permissible provided that it can be demonstrated by testing identical specimens with both the alternative flame source and the flame source specified in this test method that the tests using the alternative flame source yields failing results as often as, or more often than tests using the specified flame source.

5.2.2.3 Ring stand/clamp assembly.

5.2.2.4 Stopwatch.

5.2.2.5 Ruler.

5.2.2.6 Thermometer.

5.2.2.7 Hygrometer.

5.2.3 *Safety Hazards*— (**Warning**—There is an inherent risk of working with and around open flames. Appropriate personal protective equipment shall be used and safe work practices shall be followed. Fire suppression equipment capable of mitigating fires associated with candle accessory fire safety testing shall be readily available during testing.)

5.2.4 Procedure:

5.2.4.1 The candle ring under test shall be conditioned before testing for at least 4 h at a temperature between 20 to 30°C (68 to 86°F) and a relative humidity of less than or equal to 55%. All candle rings shall be tested in a burn test area that will be environmentally controlled to between 20 to 30°C (68 to 86°F) and less than or equal to 70% relative humidity. Once removed from the conditioning atmosphere, the candle rings shall be tested within 1 h.

5.2.4.2 The test shall be carried out with minimal disturbance of the flame source in a test area of sufficient size to accommodate the candle ring and prevent oxygen starvation of the flame source. The test surface shall be constructed of a noncombustible material and shall be cleaned before conducting each test, removing charred and molten materials or other debris from previous tests.

5.2.4.3 The finished product is to be tested in an orientation typical of the product's intended use. The candle ring shall be placed on the test surface such that it lays flat to simulate normal use. For larger accessories, it may be necessary to use a larger specimen container so that the accessory lies flat to simulate normal use with no free-flowing air space under the candle ring unless that is how the candle ring is designed.

5.2.4.4 If a candle ring is designed or advertised to be used in several orientations or configurations, it shall be tested in every orientation/configuration for which it was designed or advertised (if the candle ring fails the acceptance requirement in any of the orientations tested, it will be considered a failure).

5.2.4.5 The flame source is to be applied to each unique component on the candle ring for a period of up to 60 s. The flame source shall remain stationary during the ignition period. The flame source shall be positioned at an angle between 15 and 45° (nonburning end of flame source higher than the flame end) from horizontal.

5.2.4.6 Position the flame source such that its tip is stationary. The tip of the flame source shall be positioned approximately one half of the normal flame height away from the ring component to be tested. For example, if the flame source produces a flame approximately 35 mm (1.4 in.) in height, the tip of the flame source shall be positioned approximately 17.5 mm (0.7 in.) away from the test component. This will put the midpoint of the flame in contact with the edge of the component to be tested. Ignite the flame source allowing the flame to make contact with the candle ring component. Remove the flame source from the candle ring component as soon as the component is ignited. Measure and record the time from when the component first ignites with a self-sustained flame until the candle ring extinguishes. If the candle ring component fails to ignite after 60 s, remove the flame source and record burn time as 0 s.

5.2.4.7 Each candle ring shall be exposed to the flame at each unique component, piece, and material. Note that a simple circular candle ring made of a single material with a uniform thickness would only have to be tested at a single point. A candle ring that has several different constituents (such as a candle ring that contains pinecones, berries, leaves, flowers, and so forth) shall be tested at each of these points. In addition, if there is a single flower and a grouping of flowers, the candle ring shall be tested both at the single flower and the flower cluster since they may exhibit different flammability characteristics. A large flower and a small flower would both need to be tested even if they are made of the same material since size and thickness of the item may affect test results.

5.2.4.8 This procedure shall be repeated until a minimum of three samples per component have been evaluated. If there are