Designation: F2417 – 09

Standard Specification for Fire Safety for Candles[1]

This standard is issued under the fixed designation F2417; 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 specification is intended to prescribe minimum safety requirements for candles to provide 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 important safety practices that should be in place, such as adult supervision, close monitoring, fire detection, alarm or suppression systems, and use of candles away from combustible materials.

1.3 Flame-producing devices, such as candles, present a potential hazard to the user. This specification cannot eliminate all hazards, but will minimize the potential hazards of candles to the user.

1.4 *This specification 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.*

1.5 This specification states values in SI units which are to be regarded as the standard. The values given in parenthesis are for information only.

1.6 *This specification 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 requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester

D93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester

E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

E176 Terminology of Fire Standards

F400 Consumer Safety Specification for Lighters

F1972 Guide for Terminology Relating to Candles and Associated Accessory Items

2.2 *NFPA Standard:*[3]

NFPA 909 Code for the Protection of Cultural Resources

3. Terminology

3.1 Certain candle-related terminology is addressed in Guide F1972, and the reader is directed to that guide for definitions not found in 3.2. For definitions of terms associated with fire issues, see Terminology E176.

3.2 *Definitions:*

3.2.1 *altar candle*, *n*—candle that is constructed, packaged, and labeled as an altar candle.

3.2.1.1 *Discussion*—The candle is used in a place of worship in close proximity to the altar during the religious service or ceremony.

3.2.2 *base material*, *n*—intended fuel source for candle flame.

3.2.3 *birthday candle*, *n*—candle whose sole purpose is to be used on a birthday cake.

3.2.4 *candle flashover*, *n*—condition where the base material's vapors ignite over the entire fuel pool.

3.2.5 *Easter, Paschal, sacramental candle*, *n*—candle that is constructed, packaged, and labeled as an Easter, Paschal, or sacramental candle (or some combination of these names, for example, Easter/Paschal), generally 43.2 cm (17.0 in.) or more in length.

3.2.5.1 *Discussion*—The candle shall be displayed and burned in the place of worship as the focal candle during Easter or with the celebration of various sacraments. The candle is adorned with symbols and ornamentation as required and deemed appropriate.

3.2.6 *end of useful life*, *n*—when the candle ceases to support combustion and the candle flame(s) goes(go) out on its own, as designed, and cannot be re-lit.

3.2.7 *ensemble*, *n*—a candle and items physically packaged together and intended for use with the candle for sale as one unit at the retail level.

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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 National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

3.2.8 *fuel pool*, *n*—pool of molten base material.

3.2.9 *noncombustible*, *adj*—not capable of igniting and burning when subjected to a fire under specified conditions.

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

3.2.10 *place of worship*, *n*—any building that functions primarily as a group meeting place for the practice of religion (see NFPA 909).

3.2.10.1 *Discussion*—This includes, but is not limited to, churches, synagogues, cathedrals, temples, and meeting halls.

3.2.11 *secondary ignition*, *n*—self-sustained flame other than that on the intended wick(s) that occurs during candle use, including candle flashover.

3.2.12 *self-sustained flame*, *n*—flame that continues to burn until the fuel source is removed or depleted or requires manual extinguishing.

4. Safety Requirements

4.1 *Safety Requirements for Flame Height*—This safety requirement applies to all candles except candles intended to be burned outdoors.

4.1.1 *Rationale*:

4.1.1.1 Candle flame heights are burn characteristics that shall be monitored closely by manufacturers, consumers, retailers, and anyone associated with the distribution and use of candles.

4.1.1.2 Excessive candle flame heights can increase the risk of fires when using candle products.

4.1.1.3 The 76.2-mm (3.0-in.) maximum allowable flame height requirement for all candles excluding Easter, Paschal, sacramental, altar, and outdoor candles is, in part, based on the established requirement for nonadjustable, non-windproof lighters contained in Consumer Safety Specification F400, taking into account certain differences in measurement methods and other candle performance considerations not relevant to fire safety. In addition, candle flame heights are not static. The natural tendency of a candle is for the flame height to vary during the burn life. The maximum allowable flame height requirement in this specification takes into account such variation and anticipates that manufacturers will design candles to ensure that they remain below the maximum flame height requirement throughout the burning period. Furthermore, the manufacturer shall determine the appropriate lower flame height for optimum performance for individual candle types.

4.1.1.4 The 95.3-mm (3.75-in.) maximum allowable flame height requirement for Easter, Paschal, sacramental, and altar candles is larger than other candles because visibility of the flame during services at the place of worship warrants slightly larger flame heights.

4.1.2 *Performance Requirement*:

4.1.2.1 Candle flame heights (other than those of Easter, Paschal, sacramental, altar, and outdoor candles), when tested in accordance with the test method in 5.2, shall not exceed 76.2 mm (3.0 in.). If at any time during the testing period the flame height exceeds 76.2 mm (3.0 in.), extinguish that candle and record it as a failure.

4.1.2.2 Easter, Paschal, sacramental, and altar candle flame heights, when tested in accordance with the test method in 5.2, shall not exceed 95.3 mm (3.75 in.). If at any time during the testing period the flame height exceeds 95.3 mm (3.75 in.), extinguish that candle and record it as a failure.

4.1.2.3 For filled candles, if at any time during the testing period, regardless of flame height, the container cracks or breaks, it shall be recorded as a failure.

4.2 *Safety Requirements for Secondary Ignition*—This safety requirement applies to all candles and ensembles with the exception of Easter, Paschal, and sacramental candles specifically designed to be used during the service at the place of worship.

4.2.1 *Rationale*:

4.2.1.1 Potential hazards associated with secondary ignition sources in and on candles exist, especially if the candle is not designed properly. The ignition of material other than the intended wick(s) may result in damaged candles, elevated fuel pool temperatures, excessively rapid base material consumption, and unintended flames. All of these conditions could lead to potential fire hazards.

4.2.1.2 This requirement describes the method to determine the tendency of candles to support ignition at points other than the intended wick(s) that are integrated into the candles to enable them to burn.

4.2.2 *Performance Requirement*:

4.2.2.1 When the candle is tested in accordance with 5.2 of this specification, no secondary ignition shall occur.

4.2.2.2 Record the candle as passing the secondary ignition specification if no secondary ignition is observed during the testing.

4.3 *Safety Requirements for End of Useful Life*—This safety requirement applies to all votive, freestanding, and filled (including tealights) candles and to all ensembles containing tealights. This safety requirement does not apply to candles requiring a holder to keep them upright, birthday candles, and candles intended to float on water.

4.3.1 *Rationale*—When the candle meets the safety requirements for the end of useful life, this will reduce the risk of fires.

4.3.2 *Performance Requirement*:

4.3.2.1 Record votive and filled (including tealights) candle or tealight ensembles as passing the end of useful life requirement when tested in accordance with the test method in 5.2 if the candle or tealight ensemble meets the definition in 3.2.6 and does not break or crack the container, does not exhibit excessive flame height, and does not exhibit secondary ignition as detailed in this specification.

4.3.2.2 Record the freestanding candle as passing the end of useful life requirement when tested in accordance with the test method in 5.2 if the candle meets the definition in 3.2.6 and the flame does not impinge on the supporting surface, does not exhibit excessive flame height, does not exhibit secondary ignition as detailed in this specification, and does not tip over on its own accord when tested on a level surface in accordance with 5.2.

NOTE 1—The use of current processes or devices that limit the candle′s ability to consume all of the available fuel is offered as a way to reduce candle fires that occur at the end of the candle′s life. This does not preclude the development of other suitable means to meet the requirements set forth in 4.3-4.3.2.2. This reduces heat buildup at the end of life and the possibility of secondary ignition, candle flashover, and container failure. While it is understood that current processes and devices will not