Designation: F400 – 20

An American National Standard

Standard Consumer Safety Specification for Lighters[1]

This standard is issued under the fixed designation F400; 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 consumer safety specification covers all flame-producing consumer products commonly known as cigarette lighters, pipe lighters, and cigar lighters and such similar devices as defined in 3.1.9. Matches are specifically excluded from this safety specification; flame-producing products intended solely for igniting apparatus other than cigars, pipes, and cigarettes, including products covered by Specification F2201, are also specifically excluded from this safety specification. Lighters are specifically not intended for use as a candle, flashlight, or for other uses requiring an extended burn time.

1.2 This specification establishes requirements for lighters to ensure a reasonable degree of safety for normal use or reasonably foreseeable misuse of such lighters by users.

1.3 Lighters, being flame-producing devices, as do all flame sources, present a potential hazard to the consumer. This specification cannot eliminate all hazards, but is intended to minimize potential hazards of lighters to users.

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

1.5 The following precautionary caveat pertains only to the test methods portion, Section 8, of this specification: *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.*

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]

D2163 Test Method for Determination of Hydrocarbons in Liquefied Petroleum (LP) Gases and Propane/Propene Mixtures by Gas Chromatography

D2598 Practice for Calculation of Certain Physical Properties of Liquefied Petroleum (LP) Gases from Compositional Analysis

F2201 Consumer Safety Specification for Utility Lighters

2.2 *Other Standards:*

ISO 7941 Commerical Propane and Butane – Analysis by Gas Chromatography[3]

UL 1439 Test for Sharpness of Edges on Equipment[4]

2.3 Other references for general information are noted in Annex A1.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *burner valve*—component of a gas lighter that controls the release of fuel.

3.1.2 *burner valve orifice*—tip of the burner valve from which fuel is released.

3.1.3 *dual flame type lighter*—gas lighter that employs a burner valve system(s) that produces more than one type of flame (premixing and postmixing), which allows for a flame to be produced independently and separately (one flame at a time), or dependently and concurrently (multiple flames at a time).

3.1.4 *flame*—result of combustion of fuel that produces heat and often light which is visible with the naked eye under normal or subdued lighting conditions.

3.1.5 *flame height*—linear distance from the tip of the visible flame to the top of the shield or, in the absence of a

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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 International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, http://www.iso.org.

[4] Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, http://www.ul.com.

shield, from the tip of the visible flame to the top of the burner valve orifice or to the bottom of the exposed wick.

3.1.6 *flaring*—variance of flame height from the steady-state flame condition.

3.1.7 *fuel*—a petrochemical based material in a lighter that is released and combusted to release energy as heat and often light which is in the form of a flame.

3.1.8 *ignite*—to produce a flame with a lighter by activating the self-contained ignition and fuel release systems of that lighter in the intended manner.

3.1.9 *lighter*—manually operated flame-producing device employing a fuel and an ignition system. It is intended and normally used for deliberately igniting cigarettes, pipes, and cigars, and foreseeably be used to ignite materials such as paper, wicks, candles, and lanterns.

3.1.10 *lighter, adjustable*—lighter provided with a mechanism for the user to vary the height of the flame.

3.1.11 *lighter, automatic adjusting pipe*—lighter designed specifically for the purpose of lighting pipes and characterized by an automatic increase in flame height when tilted from an upright position.

3.1.12 *lighter, fluid*—lighter that utilizes a hexane-type fluid such as petrol or naphtha whose vapor pressure at 24 °C (75 °F) does not exceed a gage pressure of 34 kPa (5 psi).

3.1.13 *lighter, gas*—lighter that utilizes a butane, isobutane, propane, or other liquefied hydrocarbon mixture whose vapor pressure at 24 °C (75 °F) exceeds a gage pressure of 104 kPa (15 psi).

3.1.14 *lighter, nonadjustable*—lighter that has a flame height preset by the manufacturer and is not provided with a mechanism to adjust the flame height.

3.1.15 *lighter, non-refillable (disposable)*—lighter provided with a supply of fuel from the manufacturer and that is not intended to be refueled.

3.1.16 *lighter, non-self-extinguishing*—lighter that, once ignited, does not require intentional or positive action by the user to maintain a flame and requires a subsequent, deliberate user action to extinguish the flame.

3.1.17 *lighter, postmixing burner*—gas lighter in which fuel and air is mixed at the point of combustion.

3.1.18 *lighter, premixing burner*—gas lighter in which fuel and air is mixed before being supplied for combustion.

3.1.19 *lighter, refillable*—lighter that is intended to be refueled either by decanting fuel from an external container or by inserting a new prefilled fuel reservoir.

3.1.20 *lighter, self-extinguishing*—lighter that, once ignited, requires continuous intentional and positive action to maintain a flame and that is subsequently extinguished upon the termination of such positive action.

3.1.21 *multiple flame type lighter*—gas lighter that employs a burner valve system(s) that produces more than one flame of the same type of flame (premixing or postmixing), which allows for a flame to be produced independently and separately (one flame at a time), or dependently and concurrently (multiple flames at a time).

3.1.22 *shield*—structure that totally or partially surrounds the burner valve orifice of a gas lighter or the wick of a fluid lighter.

3.1.23 *spitting or sputtering*—flame phenomenon of a gas lighter wherein escape of non-evaporated, liquefied gas produces a shower of burning liquid droplets which separate from the main flame.

3.1.24 *sustained self-ignition*—propagation of a flame by other than deliberate manual operation (for example, dropping the lighter), so as to cause the ignition element to be activated, producing a flame, and the flame continues to burn.

4. General Requirements

4.1 *Flame Generation*—In order to minimize the possibility of inadvertent or self-ignition, lighters shall require a deliberate manual operation to produce a flame. This operation shall conform to at least one of the following requirements:

4.1.1 A system such that positive action on the part of the user is required to generate and maintain a flame.

4.1.2 A system that requires two or more independent motions to generate a flame.

4.1.3 A system that requires an actuating force equal to or greater than 15 N (3.4 lbf) to generate a flame (see Fig. 1 and Fig. 2 for examples of test methods).

4.1.4 Or any combination thereof (4.1.1, 4.1.2, 4.1.3).

4.2 *Flame Control*—The maximum attainable flame height for lighters shall be limited with a setting or by product design, or both. For adjustable flame-height lighters, the maximum flame height that a user will obtain on first striking the lighter without adjustment shall also be limited. These limits shall comply with the following requirements when tested in accordance with 8.1:

4.2.1 Nonadjustable fluid lighters, in accordance with 3.1.12 and 3.1.14, shall not be capable of producing a flame height greater than 120 mm (4.75 in.) when tested in accordance with 8.1.

4.2.2 Nonadjustable, postmixing and premixing burner gas lighters, in accordance with 3.1.14, 3.1.17, and 3.1.18, shall

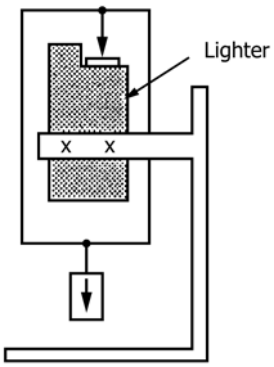

FIG. 1 Block Diagram for a Typical Example of Test Method for Measuring the Flame Generation Actuating Force as Specified in 4.1.3

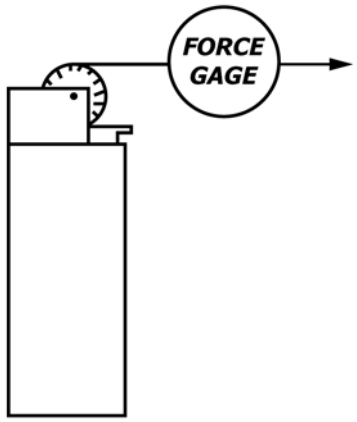

FIG. 2 Block Diagram for a Typical Example of Test Method for Measuring Force as Specified in 4.1.3

have a maximum attainable flame height of no more than 50 mm (2 in.) when tested in accordance with 8.1.

4.2.3 Adjustable postmixing burner lighters, in accordance with 3.1.10 and 3.1.17, shall not be capable of producing a flame height greater than 120 mm (4.7 in.) for refillable lighters and no greater than 100 mm (4 in.) for non-refillable lighters when deliberately adjusted by the user to the manufacturer's design limit for maximum flame height and when tested in accordance with 8.1.

4.2.4 Adjustable premixing burner lighters, in accordance with 3.1.10 and 3.1.18, shall not be capable of producing a flame height greater than 75 mm (3 in.) when deliberately adjusted by the user to the manufacturer's design limit for maximum flame height and when tested in accordance with 8.1.

4.2.5 Adjustable postmixing burner lighters, in accordance with 3.1.10 and 3.1.17, shall have the flame height adjusted by the manufacturer in such a manner that the lighter, when first ignited by the user without changing the adjustment, will not produce a flame height in excess of 100 mm (4 in.) when tested in accordance with 8.1.

4.2.6 Adjustable premixing burner lighters, in accordance with 3.1.10 and 3.1.18, shall have the flame height adjusted by the manufacturer in such a manner that the lighter, when first ignited by the user without changing the adjustment, will not produce a flame height in excess of 60 mm (2.5 in.) when tested in accordance with 8.1.

4.2.7 All adjustable flame height lighters, in accordance with 3.1.10, shall be capable of producing a flame not in excess of 50 mm (2 in.) when set at the lowest possible flame height when tested in accordance with 8.1.

4.2.8 Automatic adjusting pipe lighters, in accordance with 3.1.11, shall not be capable of producing a flame height greater than 100 mm (4 in.) when tested in accordance with 8.1 and 8.2.

4.2.9 Dual flame type lighters, in accordance with 3.1.3, for each type of flame, the flame height shall comply with the corresponding requirement for that type of lighter and flame provided in 4.2.

4.2.10 Multiple flame type lighters, in accordance with 3.1.21, the flame height of each flame shall comply with the corresponding requirement for that type of lighter and flame provided in 4.2.

4.3 *Flame-Height Adjustment*—Adjustable flame height lighters in accordance with 3.1.10 shall require a deliberate action on the part of the user to increase or decrease the flame height when the lighter is used in the normal fashion.

4.3.1 For flame control actuators that protrude from the body of the lighter, it shall require a minimum actuating force of 1 N (0.25 lbf) applied over the entire range of adjustment in a tangential direction (see Fig. 3 for an example of the test method).

4.3.2 Adjustable gas lighters having rotary movement flame control actuators approximately at right angles to the flame shall perform as follows:

4.3.2.1 When the flame control actuator is at the top of the lighter and the lighter held so the flame is oriented vertically upward, and the user is facing the flame control actuator, moving the actuator to the left shall produce a decrease in flame height.

4.3.2.2 When the flame control actuator is at the bottom of the lighter and the lighter held so that the user is looking at the actuator, a clockwise movement shall result in a decrease in flame height.

4.3.3 Adjustable gas lighters requiring motion of the flame control actuator approximately parallel to the flame axis shall decrease or increase the flame height according to the direction of the movement.

4.3.4 Adjustable flame height lighters shall indicate the direction of movement to produce a higher or lower flame height. On lighters whose adjusting mechanisms conform to 4.3.2 and 4.3.3, the direction of movement shall be permanently imprinted or engraved on the lighter. Such permanent information shall be placed on the lighter in the vicinity of the adjusting mechanism and be readily visible and understandable.

4.4 *Spitting or Sputtering and Flaring*—Gas lighters as defined in 3.1.13 when set at the maximum flame height, shall exhibit no spitting or sputtering as defined in 3.1.23 or flaring as defined in 3.1.6, when tested in accordance with 8.2.

4.5 *Flame Extinction:*

4.5.1 Adjustable postmixing burner lighters, after a 5-s burn at maximum flame height, when extinguished in the intended

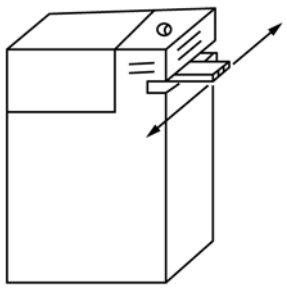

FIG. 3 Block Diagram for a Typical Example of Test Method for Measuring the Flame Control Actuating Force as Specified in 4.3.1

manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished within 2 s after such action is completed when tested in accordance with 8.3. In the case of postmixing burner lighters that have shields, an additional 2-s afterburn is acceptable only when the flame height during this additional 2-s period does not extend above the shield.

4.5.2 Adjustable postmixing burner lighters at a flame height of 50 mm (2 in.), or the maximum height the adjustment allows, if lower than 50 mm (2 in.) or nonadjustable postmixing burner lighters at their permanently set flame heights, after a 10-s burn, when extinguished in the intended manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished within 2 s after such action is completed, when tested in accordance with 8.3. In the case of gas lighters that have shields, an additional 2-s afterburn is acceptable only when the flame height during this additional 2-s period does not extend above the shield.

4.5.3 Adjustable premixing burner lighters, after a 5-s burn at maximum flame height, when extinguished in the intended manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished in no more than 5 s, when tested in accordance with 8.3.

4.5.4 Adjustable premixing burner lighters, when set at a flame height of 50 mm (2 in.) or the maximum flame height the adjustment allows for flames lower than 50 mm, or nonadjustable premixing burner lighters at their permanently set flame heights, after a 10-s burn, when extinguished in the intended manner, such as by closing a cover or releasing a button or lever, shall have any exposed flame completely extinguished in no more than 5 s, when tested in accordance with 8.3.

NOTE 1—In the case of premixing burner lighters, the total afterburn time of 5 s in this specification will be reconsidered periodically with a view to gradual reduction in line with technological progress.

4.5.5 Dual flame type lighters, for each type of flame, the extinction time shall comply with the corresponding requirement for that type of lighter and flame provided in 4.5.

4.5.6 Multiple flame type lighters, for each flame, the extinction time shall comply with the corresponding requirement for that type of lighter and flame provided in 4.5.

4.6 *Volumetric Displacement*—For gas lighters shipped with fuel, the liquid portion of the fuel shall not exceed 85 % of the volumetric capacity of the fuel chamber when tested in accordance with 8.14.

4.7 *Weight of Fuel*—For gas lighters shipped with fuel, the weight of the liquefied fuel shall not exceed 10 g.

5. Structural Integrity Requirements

5.1 Lighters shall have structural integrity as specified in requirements 5.2 – 5.9 (Table A2.1).

5.2 *Drop Test:*

5.2.1 Postmixing and premixing burner lighters as defined in 3.1.17 and 3.1.18 must be capable of withstanding three separate 1.5-m ± 0.1-m (5-ft ± 0.3-ft or ± 4-in.) drops conducted in accordance with 8.4, without fuel reservoir fragmentation, without resulting in sustained self-ignition as defined in 3.1.24, and without gas escape exceeding 15 mg/min. For lighters that remain operable, the subsequent safe operation of the lighter must not be impaired.

5.2.2 Fluid lighters as defined in 3.1.12 must be capable of withstanding three separate 1.5-m ± 0.1-m (5-ft ± 0.3-ft or ± 4-in.) drops conducted in accordance with 8.4, without fuel reservoir rupture, and without resulting in sustained self-ignition as defined in 3.1.24. For lighters that remain operable, the subsequent safe operation of the lighter must not be impaired.

5.2.3 Lighters that meet the requirements of 5.2.1 or 5.2.2, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.3 *Temperature Test*—Lighters shall be capable of withstanding a temperature of 65 °C ± 2 °C (149 °F ± 4 °F) for 4 h when tested in accordance with 8.5.

5.3.1 Lighters that meet the requirements of 5.3 and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.4 *Burning Test*—Adjustable gas lighters with the flame height set at maximum, nonadjustable gas lighters at their permanently set flame heights, or fluid-type lighters shall be capable of withstanding a burning time of 5 s with the lighter in a position 45° ± 5° below horizontal (see Fig. 4) without evidence of any burning or distortion of components so as to cause a hazardous condition.

5.4.1 Adjustable gas lighters with the flame height set at 50 mm (2 in.) or the maximum flame height the adjustment allows, for flames lower than 50 mm, nonadjustable gas lighters at their permanently set flame heights, or fluid-type lighters shall be capable of withstanding a total burning time of 10 s in two different attitudes (*a*) with the flame directed vertically upward and (*b*) with the flame directed 45° ± 5° below horizontal (see Fig. 4), without evidence of any burning or distortion of components so as to cause a hazardous condition.

5.4.2 Lighters that meet the requirements of 5.4, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.5 *Continuous Burn*—Adjustable gas lighters with the flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, for flames lower than 50 mm, nonadjustable

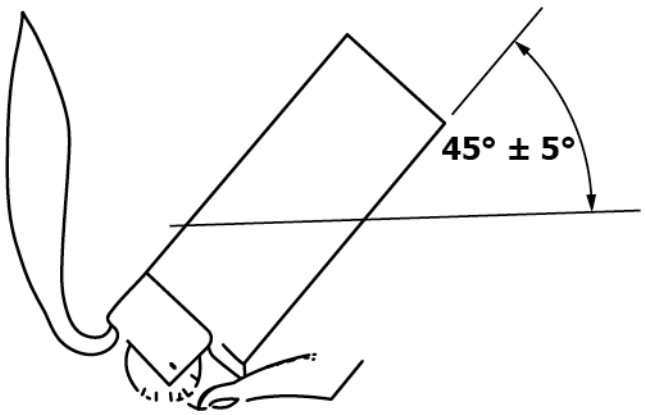

FIG. 4 Lighter in a Position of 45° ± 5°

gas lighters at their permanently set flame heights, or fluid-type lighters shall be capable of withstanding a continuous burning time of 2 min with the lighter and flame directed vertically upward without causing a hazardous condition, when tested in accordance with 8.6.

5.6 *Cycling Burn*—Adjustable gas lighters with the flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, for flames lower than 50 mm, nonadjustable gas lighters at their permanently set flame height, or fluid-type lighters shall be capable of withstanding a burning time of 20 s, repeated 10 times, when tested in accordance with 8.7.

5.6.1 Gas and fluid lighters that meet this requirement, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive. Any lighter that cannot make a flame shall not be classified as a failure.

5.7 *External Finish*—Lighters shall have no external sharp edges that would cause accidental cuts or abrasions to the user when handled or used in the intended manner. Initial inspection to be performed by visual and tactile (moving a finger slowly and carefully) assessments over the lighter to predetermine for any sharp edges that are present. For any sharp edges found, then test for sharp edges in accordance with UL 1439.

5.8 *Compatibility:*

5.8.1 Components of gas lighters as defined in 3.1.13 that come in contact with the fuel recommended by the manufacturer shall not deteriorate after the exposure to the fuel, so as to cause the lighter to fail any of the criteria contained in this specification or allow gas escape exceeding 15 mg/min when tested in accordance with 8.8.

5.8.2 Components of fluid lighters as defined in 3.1.12 that come in contact with the fuel recommended by the manufacturer shall not deteriorate after extended contact with that fuel, so as to fail any of the criteria contained in this specification when tested in accordance with 8.9.

5.8.3 Gas and fluid lighters that meet this requirement, and that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

5.9 *Pressure Tests*—Gas lighters shall be capable of withstanding an internal pressure of two times the vapor pressure occurring at 55 °C (131 °F) of the fuel recommended by the manufacturer when tested in accordance with 8.10.

6. Refillable Lighters

6.1 Refillable fluid lighters having a sealed fuel reservoir shall be free of fuel leakage from both the sealed reservoir and the sealing closure when tested in accordance with 8.11, when such sealing closure is installed in the lighter by the user in the intended manner.

6.2 *Refillable Gas Lighters*—The refilling valve in a pressurized fuel reservoir lighter shall be secure enough so as not to allow an escape of gas exceeding 15 mg/min when tested in accordance with 8.13.

7. Instructions and Warnings

7.1 All lighters shall be accompanied by the appropriate safety information (instructions or warnings, or both) communicating the proper method of use.

7.2 This safety information shall be either on the lighters themselves, or on a separate brochure or pamphlet packaged with the lighters, or on the product packaging at the point of sale. The format for this information shall emphasize the warnings that are most appropriate to the type of lighter. This safety information shall be conspicuously placed with contrasting background color, type size, or style that makes it distinct from other information.

7.3 For all lighters, the safety information shall be accompanied by the specific signal word "**WARNING**" in close proximity to the safety information.

7.4 For all lighters, the safety information shall contain the following statements:

7.4.1 "**KEEP AWAY FROM CHILDREN**" or "**KEEP OUT OF REACH OF CHILDREN**." (The statement used shall be emphasized and distinctive.)

7.4.2 Ignite lighter away from face and clothing.

7.5 For all lighters, the safety information shall include the substance of the following as appropriate to the type of lighter:

7.5.1 Be sure the flame is out after use.

7.5.2 This lighter does not self-extinguish; close cover to put out. (This statement shall accompany all non-self-extinguishing lighters.)

7.5.3 Contains flammable gas under pressure.

7.5.4 When filled, will contain flammable gas under pressure.

7.5.5 Contains flammable fluid.

7.5.6 When filled, will contain flammable fluid.

7.5.7 Never expose to heat above 50 °C (122 °F) or to prolonged sunlight.

7.5.8 Never puncture or put in fire.

7.5.9 Extreme heat is present above the visible flame. Extra care must be taken to prevent burn injury or fire. (This statement shall accompany all premixing burner lighters.)

7.5.10 Do not keep lit for more than 10 s. (This statement shall accompany all premixing burner lighters.)

7.6 *Refilling Instructions for Gas Lighters*—Refillable gas lighters, as defined in 3.1.13 and 3.1.19, shall be accompanied by specific instructions as to the correct procedure to accomplish the refill operation. These instructions shall include the fuel recommended by the manufacturer and the appropriate information to ensure the proper mating between the refill container and the fuel tank of the lighter.

7.7 *Refilling Instructions for Fluid Lighters:*

7.7.1 Fluid lighters, as defined in 3.1.12, shall be accompanied by the substance of the following:

7.7.1.1 Fill only with the type of fluid recommended by the manufacturer.

7.7.1.2 Fill slowly; do not overfill.

7.7.1.3 After filling, wipe lighter and hands dry before igniting. This is a special instruction that shall be provided from the manufacturer by at least one of the following methods:

(1) On a label attached to the lighter.

(2) Printed directly on the lighter.

(3) Printed in the safety information provided with the lighter.

7.8 *Symbols, Signs, and Icons*—In place of or in addition to the instructions and warnings in 7.4, the use of appropriate and recognizable symbols, signs, and icons are acceptable to be provided to the consumer. These safety symbols, signs, and icons shall be similar to those in other safety standards, such as ISO 9994 (as a reference listed in A1.2) or comply with applicable government regulations or meet applicable industry safety standard guidelines.

8. Test Methods

SAFETY STATEMENT–Persons using this consumer safety specification shall be familiar with normal laboratory practices that are applicable. This consumer safety specification does not propose to address all possible safety concerns that are associated with the use of this standard. It is the responsibility of the user/tester to establish appropriate safety and health practices and to ensure compliance with any regulatory requirements.

8.1 *Flame-Height Measurement*—The purpose of this procedure is to define the method of measurement of lighter flame height.

8.1.1 *Apparatus*—A nonflammable board scribed in 5-mm (0.25-in.) increments. The board shall be fitted with a standoff at the base point that positions the lighter at least 25 mm (1 in.) from the board. The board shall be supported vertically by any convenient means and tests conducted inside a draft-free chamber constructed from suitable nonflammable materials.

8.1.2 *Test Specimens*—The test specimens shall consist of lighters that are new, complete, and fueled by the manufacturer or in accordance with the manufacturer's specifications and shall be free of pre-existing mechanical damage.

8.1.3 *Procedure:*

8.1.3.1 Stabilize all lighters at 23 °C ± 2 °C (73 °F ± 4 °F) for at least 10 h prior to each flame-height measurement.

8.1.3.2 Place the lighter against the standoff with the flame directed vertically upward.

NOTE 2—In case of premixing burner lighters, it is recommended this test be conducted under subdued lighting conditions.

8.1.3.3 Ignite the lighter, allow the flame to stabilize for approximately 1.0 s, then measure the flame height to the nearest 5 mm (0.25 in.) by determining where the tip of the visible flame registers in relation to the scribed marks on the board behind the lighter, during a 5-s burn.

8.2 *Spitting, Sputtering, and Flaring Tests*—The purpose of these tests is to verify that gas lighters do not spit, sputter, or flare. Fluid lighters, as defined in 3.1.12, are excluded from this test.

8.2.1 *Test Specimens*—The test specimens shall consist of lighters that are fueled in accordance with the manufacturer's specifications.

8.2.2 *Procedure:*

8.2.2.1 Stabilize all lighters at 23 °C ± 2 °C (73 °F ± 4 °F) for at least 10 h prior to performing the test described in 8.2.2.3.

8.2.2.2 For lighters that are adjustable as defined in 3.1.10, adjust the flame to maximum flame height position.

8.2.2.3 Ignite the lighter and observe for spitting or sputtering as defined in 3.1.23 during a 5-s burn in any handheld position. Any evidence of spitting or sputtering constitutes a failure. For a lighter that does not fail, restabilize for a minimum of 5 min at 23 °C ± 2 °C (73 °F ± 4 °F) before continuing with 8.2.2.4. For different gas lighters that are used to conduct the test described in 8.2.2.4, stabilize each lighter in accordance with 8.2.2.1.

8.2.2.4 Ignite the lighter with the flame directed vertically upward and observe the flame height, and invert the lighter to a position 45° ± 5° below horizontal (see Fig. 4). Any variation in flame height exceeding 50 mm (2 in.) during a total elapsed time of 5 s or a flame height exceeding the requirements specified in 4.2 constitutes a failure. For a lighter that does not fail, restabilize for a minimum of 5 min at 23 °C ± 2 °C (73 °F ± 4 °F) before continuing with 8.2.2.5. For different gas lighters that are used to conduct the test described in 8.2.2.5, stabilize each lighter in accordance with 8.2.2.1. Automatic adjusting pipe lighters as defined in 3.1.11 shall be excluded from this test.

8.2.2.5 Invert the lighter for a period of 10 s. Return the lighter to an upright position and ignite the lighter. Observe the flame height during a 5-s burn. Any variation of flame exceeding 50 mm (2 in.) or a flame height exceeding the requirements specified in 4.2 constitutes a failure. Automatic adjusting pipe lighters as defined in 3.1.11 shall be excluded from this test.

8.3 *Flame Extinction Test*—The purpose of this test is to verify that lighters extinguish safely.

8.3.1 *Test Specimens*—The test specimens shall consist of lighters that are fueled in accordance with the manufacturer's specifications.

8.3.2 *Apparatus*—The same as for flame height measurement as described in 8.1.1.

8.3.3 *Procedure:*

8.3.3.1 Stabilize all test specimens at 23 °C ± 2 °C (73 °F ± 4 °F) for at least 10 h.

8.3.3.2 Place lighters against the flame height measurement apparatus in a normal operating position, ignite, and adjust to the flame heights specified in 4.5.1 – 4.5.4, then extinguish and allow to cool for at least 1 min. Then, ignite the lighters for the amount of time specified in 4.5.1 – 4.5.4 and extinguish in the normal manner. Measure and record the time of any burning occurring after the extinguishing action. Afterburns in excess of the amount of time specified in 4.5.1 – 4.5.4 shall constitute a failure.

8.3.3.3 For any flame extinction test that needs to be repeated on the same test specimen, restabilize it to a temperature of 23 °C ± 2 °C (73 °F ± 4 °F) for at least 10 h.

8.4 *Drop Test*—The purpose of this test is to determine that by dropping a gas lighter onto a hard surface that the drop will not result in fuel reservoir fragmentation, sustained self-ignition, gas escape exceeding 15 mg/min, or impair subsequent operation in a safe manner for a lighter that is still operable, and to determine that dropping a fluid lighter onto a hard surface will not result in fuel reservoir rupture, sustained self-ignition, or impair subsequent operation in a safe manner for a lighter that is still operable.

8.4.1 *Significance*—The drop test provides information on the ability of the lighter to withstand safely a reasonable drop that is possible during the use of the lighter.

8.4.2 *Apparatus:*

8.4.2.1 A concrete surface,

8.4.2.2 A measuring device marked to a height of 1.5 m ± 0.1 m (5 ft ± 0.3 ft or ± 4 in.), and

8.4.2.3 For gas lighters, a scale capable of reading within 0.1 mg to determine for any gas escape that is measured over an elapsed time of 1 min, or 1.0 mg for any gas escape that is measured over an elapsed time of 10 min.

8.4.3 *Test Specimens*—The specimens shall consist of new, complete, normally fueled lighters and shall be initially free of mechanical damage. Lighters used in testing for the requirements of 4.1 – 4.5 are allowed to be used for these drop tests.

8.4.3.1 *Test Specimen 1*—The lighter shall be stabilized at 23 °C ± 2 °C (73 °F ± 4 °F) for at least 10 h, and for any lighter that incorporates a flame height adjustment feature, the flame shall be adjusted to its maximum height.

8.4.3.2 *Test Specimen 2*—The lighter shall be maintained at a temperature of −10 °C ± 2 °C (14 °F ± 4 °F) for 24 h and then stabilized at a temperature of 23 °C ± 2 °C (73 °F ± 4 °F) for at least 10 h. For an adjustable lighter, the flame height shall be set at 50 mm (2 in.) maximum.

8.4.4 *Procedure:*

8.4.4.1 Allow the specimen to fall freely from 1.5 m ± 0.1 m (5 ft ± 0.3 ft or ± 4 in.) onto the concrete surface, by initially orienting in the following three modes: base down, base up, and horizontal.

8.4.4.2 Drop test the lighters fitted with a cover with the cover closed.

8.4.4.3 *Gas Lighters*—Observe the specimen during each drop for fuel reservoir fragmentation that will present a hazard to anyone in proximity or for sustained self-ignition. Either condition constitutes a failure.

8.4.4.4 *Gas Lighters*—Within 5 min after the three drops, determine by weighing whether the gas loss exceeds 15 mg/min. Weight loss exceeding this amount constitutes a failure.

8.4.4.5 *Fluid Lighters*—Observe the specimen during each drop for fuel reservoir rupture that will present a hazard to anyone in proximity or for sustained self-ignition. Either condition constitutes a failure.

8.4.4.6 Gas and fluid lighters that do not fail the tests in 8.4.4.3 – 8.4.4.5 and that are still able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

8.4.4.7 Gas and fluid lighters that are not able to be ignited in the intended manner do not constitute a failure.

8.5 *Elevated Temperature Test for Gas and Fluid Lighters*—The purpose of this test is to determine that a fuel reservoir, including closures, will withstand elevated temperatures.

8.5.1 *Significance*—This test provides information on the ability of a fuel reservoir, including closures, to withstand elevated temperatures without fuel reservoir rupture or impairing subsequent operation of the lighter in a safe manner.

8.5.2 Gas lighters must be capable of withstanding this test without gas escape exceeding 15 mg/min.

8.5.3 *Apparatus:*

8.5.3.1 An enclosure, vented to prevent accumulation of gas, capable of maintaining a temperature of 65 °C ± 2 °C (149 °F ± 4 °F).

8.5.3.2 A device for measuring the temperature to within ±2 °C (3 °F).

8.5.3.3 For gas lighters, a weighing device capable of reading within 0.1 mg.

8.5.4 *Test Specimens*—The specimens shall consist of new, normally fueled lighters and shall be initially free of mechanical damage. Lighters used for testing for the requirements of 4.1 – 4.5 are allowed to be used for this temperature test.

8.5.5 *Procedure for Gas Lighters:*

8.5.5.1 Stabilize the enclosure at 65 °C ± 2 °C (149 °F ± 3 °F).

8.5.5.2 Ignite each specimen to assure the lighter is not empty of fuel.

8.5.5.3 Place the extinguished specimens in the enclosure for 4 h.

8.5.5.4 Remove the specimens and stabilize at 23 °C ± 2 °C (73 °F ± 4 °F) for at least 1 h, but no more than 24 h.

8.5.5.5 After temperature stabilization, determine by weighing over an elapsed period of time of 1 min for a leakage rate that exceeds 15 mg/min. A leakage rate exceeding 15 mg/min constitutes a failure.

8.5.5.6 For any fuel reservoir that is totally or partially transparent, observe visually the presence of liquid fuel inside the reservoir. The absence of liquid fuel indicates the lighter is empty which constitutes a failure.

8.5.5.7 For any fuel reservoir that is not transparent, attempt to ignite the lighter. For any lighter where ignition in the intended manner is achieved, proceed to 8.5.5.8. For lighters that do not ignite:

(1) Weigh the lighter with a weighing device capable of reading within 0.1 mg.

(2) Open the reservoir (open the sealing mechanism, or open the burner valve for a non-refillable lighter or open the refilling valve for a refillable lighter) to empty the fuel reservoir.

(3) Weigh the lighter again with all its components.

(4) For any mass that is unchanged (within ±10 mg) the lighter was an empty lighter, which constitutes a failure.

8.5.5.8 Gas lighters that are able to be ignited in the intended manner shall subsequently meet all the applicable requirements of 4.1 – 4.5, inclusive.

8.5.5.9 Gas lighters that are not able to be ignited in the intended manner and are not empty of fuel do not constitute a failure.

8.5.6 *Procedure for Fluid Lighters:*