



Standard Consumer Safety Specification for Lighters¹

This standard is issued under the fixed designation F 400; 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 approval. 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 2.1.7. Matches are specifically excluded from this safety specification; flame-producing products intended solely for igniting apparatus other than cigars, pipes, and cigarettes 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, can, 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 7, 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 Definitions of Terms Specific to This Standard:

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

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

2.1.3 *flame*—the result of combustion of fuel that produces heat and often light which could be visible or non-visible with the naked eye under normal lighting conditions.

2.1.4 *flame height*—a linear distance from the tip of the visible flame to the top of the shield or, in the absence of a shield, from the tip of the visible flame to the top of the wick or burner valve orifice.

2.1.4.1 *Discussion*—Flame heights shall be measured in accordance with 7.1.

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

2.1.6 *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.

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

2.1.8 *lighter, adjustable*—a lighter that is received by the consumer with a mechanism for the user to vary the height of the flame manually.

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

2.1.10 *lighter, disposable*—a lighter that is received by the user with a supply of fuel and that is not intended to be refueled.

2.1.11 *lighter, fluid*—a 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).

2.1.12 *lighter, gas*—a 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 103 kPa (15 psi).

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

2.1.14 *lighter, non-self-extinguishing*—a 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.

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

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

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

2.1.18 *lighter, self-extinguishing*—a 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.

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

2.1.20 *sustained self-ignition*—the propagation of a flame by other than deliberate manual operation, such as by dropping the lighter, so as to cause the ignition element to be activated and the flame to continue to burn.

2.1.21 *spitting or sputtering*—a flame phenomenon of a gas lighter wherein escape of nonevaporated or liquid fuel produces a shower of burning liquid droplets which separate from the main flame.

3. General Requirements

3.1 *Flame Generation* (Table 1)—In order to minimize the possibility of inadvertent or self-ignition, lighters shall require a deliberate manual operation to produce a flame. These operations shall conform to at least one of the following requirements:

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

TABLE 1 Specification Requirements

Characteristic	Requirement	Test Method Section
GENERAL REQUIREMENTS		
Flame generation	(1) positive action to generate and maintain a flame, or (2) two or more independent motions to generate flame, or (3) an actuating force equal to or greater than 15 N (3.4 lbf) (Appendix X2) (4) or any combination thereof	
Flame control	Annex A1	7.1
Flame height adjustment	(1) deliberate action to adjust, (2) minimum actuating force of 1 N (0.25 lbf) if mechanism protrudes from lighter (Appendix X2), (3) indication of direction of movement for higher and lower flame heights	
Spitting or sputtering	none allowed	7.2
Flaring	maximum of 50-mm (2-in.) variation from the steady-state flame condition	7.2
Flame extinction:		
All postmixing burner lighters	(1) complete extinction of exposed flame within 2 s, or (2) additional 2 s if flame height during this time does not extend above shield	7.3
Non-self-extinguishing lighters	packaged with statement (see Section 6)	
All premixing burner lighters	(3) complete extinction of exposed flame in no more than 5 s	7.3
STRUCTURAL INTEGRITY REQUIREMENTS		
Drop:		
Gas lighters	three separate 1.5-m (5-ft) drops without fuel reservoir fragmentation, sustained self-ignition or gas escape exceeding 15 mg/min	
Fluid lighters	three separate 1.5-m (5-ft) drops without fuel tank fragmentation or sustained self-ignition	
All lighters	if still operable, shall meet all general requirements of Section 3	7.5
Temperature:		
All lighters	withstand 55°C (131°F) for 4 h	
Gas lighters	after stabilization at 23°C (73°F) gas escape not to exceed 15 mg/min	
All lighters	if still operable after returning to 23°C (73°F) shall meet all general requirements of Section 3	
Burning		
All lighters	(1) withstand 5-s burn with flame at maximum in any handheld attitude without burning or distortion of components ^A (2) withstand 10-s burn with flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if lower than 50 mm, on adjustable gas lighters, or preset flame heights on nonadjustable gas lighters and fluid lighters in any handheld attitude with the lighter 45° below the horizontal, without burning or distortion of components ^A	7.6
Continuous burn		
All lighters	withstand 2-min burn with flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if lower than 50 mm, on adjustable lighters, or preset flame heights on nonadjustable gas lighters and fluid lighters, with flame in vertical attitude without continued burning of component parts, expulsion of valve mechanism or fuel reservoir rupture	
Cycling burn		
All lighters	(1) withstand 20-s burn with flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if lower than 50 mm, on adjustable gas lighters, or preset flame heights on nonadjustable gas lighters and fluid lighters, repeated 10 times (2) if still operable after returning to 23°C (73°F), shall meet all general requirements of Section 3	7.7
External finish		
Compatibility:		
Gas lighters	no deterioration of components that come in contact with the fuel recommended by the manufacturer, or gas escape exceeding 15 mg/min	7.8
Fluid lighters	no deterioration of components that come in contact with the fuel recommended by the manufacturer	7.9
Pressure		
Gas lighters	withstand internal pressure of two times the vapor pressure occurring at 55°C (131°F) without rupture	7.10
Refilling:		
Fluid lighters, sealed reservoirs	lighter sealing closures and fuel reservoirs shall be free of leakage	7.11, 7.12
Gas lighters	lighter refill valves shall not allow gas escape exceeding 15 mg/min	7.13
Volumetric displacement	liquid portion of fuel shall not exceed 85 % of the volumetric capacity of the fuel reservoir	7.14

^AExcept those intended to burn during flame propagation.

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

3.1.3 A system that requires an actuating force equal to or greater than 15 N (3.4 lbf) to generate a flame (see Fig. X2.1 or Fig. X2.2 for an example of test equipment).

3.2 *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 consumer 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 7.1:

3.2.1 Nonadjustable fluid lighters, as defined in 2.1.13 and 2.1.11, shall not be capable of producing a flame height greater than 120 mm (4.75 in.) when tested in accordance with 7.1. See also Annex A1 on AQL's and Appendix X1 on sampling scheme references.

3.2.2 Nonadjustable, postmixing and premixing burner lighters, as defined in 2.1.13, 2.1.15, and 2.1.16, in the users hands shall have a maximum attainable flame height of no more than 50 mm (2 in.) when tested in accordance with 7.1. See Annex A1 for mandatory AQL's and Appendix X1 on sampling scheme references.

3.2.3 Adjustable postmixing burner lighters, as defined in 2.1.8 and 2.1.15, shall not be capable of producing a flame height greater than 120 mm (4.75 in.) when deliberately adjusted by the user to the manufacturer's design limit for maximum flame height and when tested in accordance with 7.1. See Annex A1 for mandatory AQL's and Appendix X1 on sampling scheme references.

3.2.4 Adjustable premixing burner lighters, as defined in 2.1.8 and 2.1.16, 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 7.1. See Annex A1 for mandatory AQL's and Appendix X1 on sampling scheme references.

3.2.5 Adjustable postmixing burner lighters, as defined in 2.1.8 and 2.1.15, shall have the flame height adjusted prior to reaching the user in such a manner that the lighter, when first struck 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 7.1. See Annex A1 for mandatory AQL's and Appendix X1 on sampling scheme references.

3.2.6 Adjustable premixing burner lighters, as defined in 2.1.8 and 2.1.16, shall have the flame height adjusted prior to reaching the user in such a manner that the lighter, when first struck 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 7.1. See Annex A1 for mandatory AQL's and Appendix X1 on sampling scheme reference.

3.2.7 All adjustable flame height lighters, as defined in 2.1.8, 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 7.1.

3.3 *Flame-Height Adjustment* (Table 1)—Adjustable flame height lighters as defined in 2.1.8 shall require a deliberate action on the part of the user to increase the flame height when the lighter is used in the normal fashion.

3.3.1 If flame control actuators 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. X2.3 for an example of the test equipment).

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

3.3.2.1 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.

3.3.2.2 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.

3.3.3 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.

3.3.4 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 3.3.2 and 3.3.3, the direction of movement may be permanently imprinted or engraved on the lighter or may be of a nonpermanent nature such as an attached tag or stick-on label. Such a nonpermanent tag or label shall be placed on the lighter in the vicinity of the adjusting mechanism and be readily visible and understandable.

3.3.5 On lighters whose adjusting mechanisms do not conform to 3.3.2 and 3.3.3, the direction of movement shall be permanently imprinted or engraved on the lighter. This shall be in the vicinity of the adjusting mechanism and be readily visible and understandable.

3.4 *Spitting or Sputtering and Flaring* (Table 1)—Gas lighters as defined in 2.1.12 when set at the maximum flame height, shall exhibit no spitting or sputtering as defined in 2.1.21 or flaring as defined in 2.1.5, when tested in accordance with 7.2.

3.5 *Flame Extinction* (Table 1):

3.5.1 Adjustable postmixing 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 within 2 s after such action is completed when tested in accordance with 7.3. In the case of postmixing burner lighters that have shields, an additional 2-s afterburn is acceptable if the flame height during this additional 2-s period does not extend above the shield.

3.5.2 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 7.3. In the case of gas lighters that have shields, an additional 2-s afterburn is acceptable if the flame height during this additional 2-s period does not extend above the shield.

3.5.3 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 7.3.

3.5.4 Adjustable premixing burner lighters, when set at a flame height of 50 mm (2 in.) or the maximum flame height the adjustment allows if lower than 50 mm, or nonadjustable premixing burner lighters at their permanently set flame heights, after a 10-s burn, when closed 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 7.3.

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.

3.6 *Volumetric Displacement* (Table 1)—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 7.14.

4. Structural Integrity Requirements

4.1 Lighters shall have structural integrity as specified in requirements 4.2-4.9 (Table 1).

4.2 *Drop Test*:

4.2.1 Postmixing and premixing burner lighters as defined in 2.1.15 and 2.1.16 must be capable of withstanding three separate 1.5-m (5-ft) drops conducted in accordance with 7.4, without fuel reservoir fragmentation, without resulting in sustained self-ignition as defined in 2.1.20, without gas escape exceeding 15 mg/min and without impairing the subsequent safe operation of the lighter.

4.2.2 Fluid lighters as defined in 2.1.11 must be capable of withstanding three separate 1.5-m (5-ft) drops conducted in accordance with 7.4, without fuel reservoir rupture, without resulting in sustained self-ignition as defined in 2.1.20, and without impairing the subsequent safe operation of the lighter.

4.2.3 Lighters that meet the requirements of 4.2.1 or 4.2.2, and that are still operable in the intended manner, shall be capable of meeting all the applicable requirements of Section 3 of this specification.

4.3 *Temperature Test*—Lighters shall be capable of withstanding a temperature of 55°C (131°F) for 4 h when tested in accordance with 7.5.

4.3.1 Lighters that meet the requirements of 4.3 and that are still operable in the intended manner shall be capable after return to 23 ± 2°C (73 ± 4°F) of meeting the applicable requirements in Section 3 of this specification.

4.4 *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 in any hand-held attitude without evidence of any burning or distortion of components so as to cause a hazardous condition.

4.4.1 Adjustable gas lighters with the flame height set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if lower than 50 mm, nonadjustable gas lighters at their permanently set flame heights, or fluid-type lighters shall be capable of withstanding a burning time of 10 s in any hand-held attitude with the lighter in a position 45° below the horizontal, without evidence of any burning or distortion of components so as to cause a hazardous condition.

4.5 *Continuous Burn*—Adjustable gas lighters with the flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if lower than 50 mm, nonadjustable 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 flame in a vertical attitude without causing a hazardous condition, when tested in accordance with 7.6.

4.6 *Cycling Burn*—Adjustable gas lighters with the flame set at 50 mm (2 in.) or the maximum flame height the adjustment allows, if 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 7.7.

4.7 *External Finish*—Lighters shall have no external sharp edges that could cause accidental cuts or abrasions to the consumer when handled or used in the intended manner.

4.8 *Compatibility*:

4.8.1 Components of gas lighters as defined in 2.1.12 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 7.8.

4.8.2 Components of fluid lighters as defined in 2.1.11 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 7.9.

4.9 *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 7.10.

5. Refilling of Lighters

5.1 Refillable fluid lighters, as defined in 2.1.11 and 2.1.17, shall include specific instructions and warnings as applicable in accordance with Section 6.

5.2 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 7.11, when such sealing closure is installed in the lighter by the user in the intended manner.

5.3 Refillable gas lighters, as defined in 2.1.12 and 2.1.17, shall have specific training instructions and warnings as applicable in accordance with Section 6.

5.4 *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 7.13.

6. Instructions and Warnings

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

6.2 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 should 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.

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

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

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

6.4.2 Ignite lighter away from face and clothing.

6.5 Use one of the following as appropriate for the lighter type:

6.5.1 Be sure the flame is out after use. (This statement shall accompany all self-extinguishing lighters.)

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

6.6 For all lighters, the safety information may include the substance of the following as appropriate for the lighter type:

6.6.1 Contains flammable gas under pressure.

6.6.2 Contains flammable fluid.

6.6.3 When filled, will contain flammable fluid.

6.6.4 Never expose to heat above 49°C (120°F) or to prolonged sunlight.

6.6.5 Never puncture or put in fire.

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

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

6.7 *Refilling Instructions for Gas Lighters*—Refillable gas lighters, as defined in 2.1.12 and 2.1.17, 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.

6.8 *Refilling Instructions for Fluid Lighters*:

6.8.1 Fluid lighters, as defined in 2.1.11, shall be accompanied by the substance of the following:

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

6.8.1.2 Fill slowly; never overfill.

6.8.1.3 Wipe lighter and hands dry before igniting. (This is a special instruction and should also be attached to the lighter

or it may be printed directly on the lighter. It may also be printed in the safety information.)

7. Test Methods

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

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

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

7.1.3 *Procedure*:

7.1.3.1 Standardize the lighter flame-height measurements by stabilizing all lighters at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) for at least 10 h prior to each flame-height measurement.

7.1.3.2 Place the lighter against the standoff in the desired attitude.

7.1.3.3 Ignite the lighter and 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.

7.2 *Spitting, Sputtering, and Flaring Test*—The purpose of this test is to verify that gas lighters do not spit, sputter, or flare.

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

7.2.2 *Procedure*:

7.2.2.1 Stabilize all lighters at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) for at least 10 h prior to performing the test described in 7.2.2.3.

7.2.2.2 If lighters are adjustable as defined in 2.1.8, adjust the flame to maximum position.

7.2.2.3 Ignite the lighter and observe for spitting or sputtering as defined in 2.1.21 during a 5-s burn in any hand-held position. Any evidence of spitting or sputtering constitutes a failure. If lighter does not fail, restabilize for a minimum of 5 min at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) before continuing with 7.2.2.4.

7.2.2.4 Ignite the lighter in an upright position, observe the flame height, and invert the lighter to a position 45° below the horizontal. 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 3.2 constitutes a failure. If lighter does not fail, restabilize for a minimum of 5 min at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) before continuing with 7.2.2.5. Pipe lighters as defined in 2.1.9 shall be excluded from this test.

NOTE 2—Measure the downward flame height in accordance with Fig. 1.

NOTE 3—If different lighters are used to conduct the tests described in 7.2.2.3-7.2.2.5 stabilize these in accordance with 7.2.2.1.

7.2.2.5 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

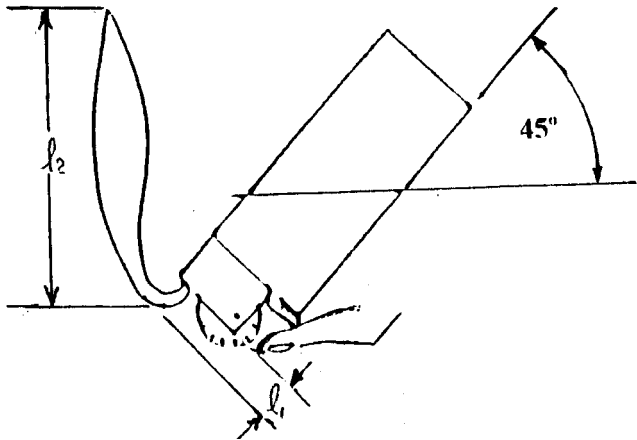


FIG. 1 Flame Height Measurement

exceeding 50 mm (2 in.) or a flame height exceeding the requirements specified in 3.2 constitutes a failure. Pipe lighters as defined in 2.1.9 shall be excluded from this test.

7.2.2.6 Pipe lighters as defined in 2.1.9, when placed in any position, shall not produce a flame height greater than 100 mm (4 in.).

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

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

7.3.2 *Apparatus*—The same as for flame height measurement as described in 7.1.1.

7.3.3 *Procedure:*

7.3.3.1 Stabilize all test specimens at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) for at least 10 h.

7.3.3.2 Place lighters against the flame height measurement apparatus in a normal operating position, ignite, and adjust to the flame heights specified in 3.5.1-3.5.4, then extinguish and allow to cool for 1 min. Then, ignite the lighters for the amount of time specified in 3.5.1-3.5.4 and extinguish in the normal manner. Measure and record any burning occurring after the extinguishing action. Afterburns in excess of the amount of time specified in 3.5.1-3.5.4 will constitute a failure.

7.3.3.3 If the flame extinction test needs to be repeated on the same test specimen, restabilize it to a temperature of $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) for at least 10 h.

7.4 *Drop Test*—The purpose of this test is to determine if dropping a gas lighter onto a hard surface will result in fuel reservoir fragmentation, sustained self-ignition, gas escape exceeding 15 mg/min, or impair subsequent operation in a safe manner, and to determine if dropping a fluid lighter onto a hard surface will result in fuel reservoir rupture, sustained self-ignition, or impair subsequent operation in a safe manner.

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

7.4.2 *Apparatus:*

7.4.2.1 A concrete surface,

7.4.2.2 A measuring device marked to a height of 1.5 m (5 ft), and

7.4.2.3 For gas lighters, a scale capable of reading within 0.1 mg if gas escape is measured over an elapsed time of 1 min, or 1.0 mg if gas escape is measured over an elapsed time of 10 min.

7.4.3 *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 3.1-3.5 may be used for these drop tests.

7.4.3.1 *Test Specimen 1*—The lighter shall be stabilized at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) for at least 10 h, and if it incorporates a flame height adjustment feature, the flame shall be adjusted to its maximum height.

7.4.3.2 *Test Specimen 2*—The lighter shall be maintained at a temperature of $-10 \pm 2^\circ\text{C}$ ($14 \pm 4^\circ\text{F}$) for 24 h and then stabilized at a temperature of $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) for at least 10 h. For an adjustable lighter, the flame height shall be set at 50 mm (2 in.) maximum.

7.4.4 *Procedure:*

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

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

7.4.4.3 *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.

7.4.4.4 *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.

7.4.4.5 *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.

7.4.4.6 Lighters that do not fail the tests in 7.4.4.3-7.4.4.5 and are still operable in the intended manner shall immediately pass all requirements of Section 3.

7.5 *Temperature Test*—The purpose of this test is to determine if a fuel reservoir, including closures, will withstand elevated temperatures.

7.5.1 *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.

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

7.5.3 *Apparatus:*

7.5.3.1 An enclosure, vented to prevent accumulation of gas, or a temperature-controlled water bath, capable of maintaining a temperature of $55 \pm 2^\circ\text{C}$ ($131 \pm 3^\circ\text{F}$).

7.5.3.2 A device for measuring the temperature to within $\pm 2^\circ\text{C}$ (3°F).

7.5.3.3 For gas lighters, a scale capable of reading within 0.1 mg if gas escape is measured over an elapsed time of 1 min, or 1.0 mg if gas escape is measured over an elapsed time of 10 min.