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§ 1610.6(a) and § 1610.6(b), when tested as described in § 1610.6, shall be classified as Class 1, Normal flammability, when the burn time is more than 7 seconds, or when they burn with a rapid surface flash (0 to 7 seconds), provided the intensity of the flame is so low as not to ignite or fuse the base fabric.

(b) *Class 2, Intermediate flammability*. Class 2 fabrics, applicable only to raised-fiber surface textiles, are considered to be of intermediate flammability, but may be used for clothing. This class shall include textiles which meet the minimum requirements set forth in paragraph (b)(2) of this section.

(1) *Plain surface textile fabric*. Class 2 is not applicable to plain surface textile fabrics.

(2) *Raised surface textile fabric*. Such textiles in their original state and/or after being refurbished as described in § 1610.6(a) and § 1610.6(b), when tested as described in § 1610.6, shall be classified as Class 2, Intermediate flammability, when the burn time is from 4 through 7 seconds, both inclusive, and the base fabric ignites or fuses.

(c) *Class 3, Rapid and intense burning*. Class 3 textiles exhibit rapid and intense burning, are dangerously flammable and shall not be used for clothing. This class shall include textiles which have burning characteristics as described in paragraphs (c)(1) and (c)(2) of this section. Such textiles are considered dangerously flammable because of their rapid and intense burning.

(1) *Plain surface textile fabric*. Such textiles in their original state and/or after refurbishing as described in § 1610.6(a) and § 1610.6(b), when tested as described in § 1610.6, shall be classified as Class 3 Rapid and Intense Burning when the time of flame spread is less than 3.5 seconds.

(2) *Raised surface textile fabric*. Such textiles in their original state and/or after refurbishing as described in § 1610.6(a) and § 1610.6(b), when tested as described in § 1610.6, shall be classified as Class 3 Rapid and Intense Burning when the time of flame spread is less than 4 seconds, and the base fabric starts burning at places other than the point of impingement as a result of the surface flash (test result code SFBB).

TABLE 1 TO § 1610.4—SUMMARY OF TEST CRITERIA FOR SPECIMEN CLASSIFICATION
[SEE § 1610.7]

Class	Plain surface textile fabric	Raised surface textile fabric
1	Burn time is 3.5 seconds or more ACCEPTABLE (3.5 sec is a pass).	(1) Burn time is greater than 7.0 seconds; or (2) Burn time is 0–7 seconds with no base burns (SFBB). Exhibits rapid surface flash only. ACCEPTABLE.
2	Class 2 is not applicable to plain surface textile fabrics.	Burn time is 4–7 seconds (inclusive) with base burn (SFBB). ACCEPTABLE.
3	Burn time is less than 3.5 seconds. NOT ACCEPTABLE.	Burn time is less than 4.0 seconds with base burn (SFBB). NOT ACCEPTABLE.

§ 1610.5 Test apparatus and materials.

(a) *Flammability apparatus*. The flammability test apparatus consists of a draft-proof ventilated chamber enclosing a standardized ignition mechanism, sample rack, and automatic timing mechanism. The flammability apparatus shall meet the minimum requirements for testing as follows.

(1) *Test chamber—(i) Test chamber structure*. The test chamber shall be a metal, draft-proof ventilated chamber. The test chamber shall have inside dimensions of 35.3 cm high by 36.8 cm wide by 21.6 cm deep (14 in by 14.5 in by 8.5 in). There shall be eleven or twelve 12.7 mm diameter (0.5 in) holes equidistant along the rear of the top closure. The front of the chamber shall be a close fitting door with an insert made of clear material (i.e., glass, plexiglass) to permit observation of the entire test. A ventilating strip is provided at the base of the door in the front of the apparatus. The test chamber to be used in this test method is illustrated in Figures 1 and 2 of this part.

(ii) *Specimen rack*. The specimen rack provides support for the specimen holder (described in paragraph (a)(1)(iii) of this section) in which the specimen is

mounted for testing. The angle of inclination shall be 45°. Two guide pins projecting downward from the center of the base of the rack travel in slots provided in the floor of the chamber so that adjustment can be made for the thickness of the specimen in relation to the test flame. A stop shall be provided in the base of the chamber to assist in adjusting the position of the rack. The specimen rack shall be constructed so that: It supports the specimen holder in a way that does not obstruct air flow around the bottom edge of the fabric specimen; and the fabric specimen is properly aligned with the igniter tip during flame impingement. The specimen rack to be used in this test method is illustrated in Figures 1 through 3 of this part. Movable rack: Refer to the manufacturers' instruction in relation to the adjustment procedure to move the rack into the appropriate position for the indicator finger alignment.

(iii) *Specimen holder*. The specimen holder supports and holds the fabric specimen. The specimen holder shall consist of two 2 mm (0.06 in) thick U-shaped matched metal plates. The plates are slotted and loosely pinned for alignment. The specimen shall be firmly sandwiched in between the metal plates with clamps mounted along the sides. The two plates of the holder shall cover all but 3.8 cm (1.5 in) of the width of the specimen for its full length. See Figures 1 and 3 of this part. The specimen holder shall be supported in the draft-proof chamber on the rack at an angle of 45°.

(iv) *Indicator finger*. The position of the specimen rack (described in paragraph (a)(1)(ii) of this section) shall be adjusted, so the tip of the indicator finger just touches the surface of the specimen. An indicator finger is necessary to ensure that the tip of the test flame will impinge on the specimen during testing. The indicator finger to be used in this test method is illustrated in Figures 1, 2 and 4 of this part.

(v) *Ignition mechanism*. The ignition mechanism shall consist of a motor driven butane gas jet formed around a 26-gauge hypodermic needle and creates the test flame. The test flame shall be protected by a shield. See Figure 5. The test flame is adjusted to 16 mm (0.625 in) and applied to the specimen for 1 second. A trigger device is located in the front of the apparatus, the pulling or pushing of which activates the test flame impingement and timing device. Electro-mechanical devices (*i.e.*, servo-motors, solenoids, microswitches, and electronic circuits, in addition to miscellaneous custom made cams and rods, shock absorbing linkages, and various other mechanical components) can be used to control and apply the flame impingement. See Figure 6 of this part.

(vi) *Draft ventilator strip*. A draft ventilator strip shall be placed across the front opening, sealing the space between the sliding door when in lowered position and the base on which the grid rack is attached. (See Figure 1 of this part.)

(vii) *Stop weight*. The weight, attached by means of a clip to the stop thread, in dropping actuates the stop motion for the timing mechanism. The weight shall be 30g ±5g (1.16 oz. ±0.18 oz).

(viii) *Door*. The door shall be a clear (*i.e.* glass or plexiglass) door, close fitting and allows for viewing of the entire test.

(ix) *Hood*. The hood or other suitable enclosure shall provide a draft-proof environment surrounding the test chamber. The hood or other suitable enclosure shall have a fan or other means for exhausting smoke and/or fumes produced by testing.

(2) *Stop thread and thread guides—(i) Stop thread*. The stop thread shall be stretched from the spool through suitable thread guides provided on the specimen holder and chamber walls.

(ii) *Stop thread supply*. This supply, consisting of a spool of No. 50, white, mercerized, 100% cotton sewing thread, shall be fastened to the side of the chamber and can be withdrawn by releasing the thumbscrew holding it in position.

(iii) *Thread Guides*. The thread guides permit the lacing of the stop thread in the proper position exactly 127 mm (5 in) from the point where the center of the ignition flame impinges on the test specimen. The stop thread shall be 9.5 mm (0.37 in) above and parallel to the lower surface of the top plate of the specimen holder. This condition can be

achieved easily and reproducibly with the use of a thread guide popularly referred to as a ''sky hook'' suspended down from the top panel along with two L-shaped thread guides attached to the upper end of the top plate of the specimen holder. Two other thread guides can be installed on the rear panel to draw the thread away from directly over the test flame. The essential condition, however, is the uniform height of 9.5 mm (0.37 in) for the stop thread and not the number, placement or design of the thread guides.

(iv) *Stop weight thread guide*. This thread guide shall be used to guide the stop thread when attaching the stop weight.

(3) *Supply for test flame*. (i) The fuel supply shall be a cylinder of chemically pure (c. p.) butane.

(ii) The fuel-tank control valve shall consist of a sensitive control device for regulating the fuel supply at the tank.

(iii) The flow control device, such as a manometer or flow meter, shall be sufficient to maintain a consistent flame length of 16 mm (⅝ in).

(4) *Timing Device*. The timing device consists of a timer, driving mechanism and weight. The timer, by means of special attachments, is actuated to start by connection with the gas jet. A trigger device (described in paragraph (a)(1)(v) of this section) activates the flame impingement, causing the driving mechanism to move the gas jet to its most forward position and automatically starts the timer at the moment of flame impact with the specimen. The falling weight, when caused to move by severance of the stop thread, stops the timer. Time shall be read directly and recorded as a burn time. Read burn time to 0.1 second. An electronic or mechanical timer can be used to record the burn time, and electro-mechanical devices (*i.e.*, servomotors, solenoids, micro-switches, and electronic circuits, in addition to miscellaneous custom made cams and rods, shock absorbing linkages, and various other mechanical components) can be used to control and apply the flame impingement.

(b) *Specimen preparation equipment and materials*—(1) *Laboratory drying oven*. This shall be a forced circulation drying oven capable of maintaining 105° ±3 °C (221° ±5 °F) for 30 ±2 minutes to dry the specimens while mounted in the specimen holders.

(2) *Desiccator*. This shall be an airtight and moisture tight chamber capable of holding the specimens horizontally without contacting each other during the cooling period following drying, and shall contain silica gel desiccant.

(3) *Desiccant*. Anhydrous silica gel shall be used as the desiccant.

(4) *Automatic washing machine*. The automatic washing machine shall be as described in § 1610.6(b)(1)(ii).

(5) *Automatic tumble dryer*. The automatic tumble dryer shall be as described in § 1610.6(b)(1)(ii).

(6) *Commercial dry cleaning machine*. The commercial dry cleaning machine shall be capable of providing a complete automatic dry-to-dry cycle using perchloroethylene solvent and a cationic drycleaning detergent as specified in § 1610.6(b)(1)(i).

(7) *Dry cleaning solvent*. The solvent shall be perchloroethylene, commercial grade.

(8) *Dry cleaning detergent*. The dry cleaning detergent shall be cationic class.

(9) *Laundering detergent*. The laundering detergent shall be as specified in § 1610.6(b)(1)(ii).

(10) *Brushing device*. The brushing device shall consist of a base board over which a small carriage is drawn. See Figure 7 of this part. This carriage runs on parallel tracks attached to the edges of the upper surface of the base board. The brush is hinged with pin hinges at the rear edge of the base board and rests on the carriage vertically with a pressure of 150 gf (0.33 lbf). The brush shall consist of two rows of stiff nylon bristles mounted with the tufts in a staggered position. The bristles are 0.41 mm (0.016 in) in diameter and 19 mm (0.75 in) in length. There are 20 bristles per tuft and 4 tufts per inch. See Figure 8 of this part. A clamp is attached to the forward edge of the movable carriage to permit holding the specimen on the carriage during the brushing operation. The purpose of the metal plate or ''template'' on the carriage of the brushing device is to support the specimen during the brushing operation.

The template shall be 3.2 mm (0.13 in) thick. See Figure 9 of this part.

[73 FR 15640, Mar. 25, 2008, as amended at 73 FR 62187, Oct. 20, 2008]

§ 1610.6 Test procedure.

The test procedure is divided into two steps. Step 1 is testing in the original state; Step 2 is testing after the fabric has been refurbished according to paragraph (b)(1) of this section.

(a) *Step 1—Testing in the original state.* (1) Tests shall be conducted on the fabric in a form or state ready for use in wearing apparel. Determine whether the fabric to be tested is a plain surface textile fabric or a raised surface textile fabric as defined in § 1610.2 (k) and (l). There are some fabrics that require extra attention when preparing test specimens because of their particular construction characteristics. Examples of these fabrics are provided in paragraphs (a)(1)(i) through (vi) of this section along with guidelines for preparing specimens from these fabrics. This information is not intended to be all-inclusive.

(i) *Flocked fabrics.* Fabrics that are flocked overall are treated as raised surface textile fabrics as defined in § 1610.2(l). Flock printed fabrics (usually in a pattern and not covering the entire surface) shall be treated as plain surface textile fabrics as defined in § 1610.2(k).

(ii) *Cut velvet fabrics.* Cut velvet fabrics with a patterned construction shall be considered a raised surface textile fabric as defined in § 1610.2(l).

(iii) *Metallic thread fabrics.* Metallic thread fabrics shall be considered plain surface textile fabrics provided the base fabric is smooth. The specimens shall be cut so that the metallic thread is parallel to the long dimension of the specimen and arranged so the test flame impinges on a metallic thread.

(iv) *Embroidery.* Embroidery on netting material shall be tested with two sets of preliminary specimens to determine the most flammable area (which offers the greatest amount of netting or embroidery in the 150 mm (6 in.) direction). One set of netting only shall be tested and the other set shall consist mainly of embroidery with the specimens cut so that the test flame impinges on the embroidered area. Test the most flammable area according to the plain surface textile fabric requirements. The full test shall be completed on a sample cut from the area that has the fastest burn rate.

(v) *Burn-out patterns.* Flat woven constructions with burn-out patterns shall be considered plain surface textile fabrics as defined in § 1610.2(k).

(vi) *Narrow fabrics and loose fibrous materials.* Narrow fabrics and loose fibrous materials manufactured less than 50 mm (2 in) in width in either direction shall not be tested. If a 50 mm by 150 mm (2 in by 6 in) specimen cannot be cut due to the nature of the item, *i.e.* hula skirts, leis, fringe, loose feathers, wigs, hairpieces, etc., do not conduct a test.

(2) *Plain surface textile fabrics:*

(i) *Preliminary trials.* Conduct preliminary trials to determine the quickest burning direction. The specimen size shall be 50 mm by 150 mm (2 in by 6 in). Cut one specimen from each direction of the fabric. Identify the fabric direction being careful not to make any identifying marks in the exposed area to be tested. Preliminary specimens shall be mounted and conditioned as described in paragraphs (a)(2)(ii) through (iv) of this section and then tested following the procedure in paragraph (c) of this section to determine if there is a difference in the burning characteristics with respect to the direction of the fabric.

(ii) *Identify and cut test specimens.* Cut the required number of test specimens to be tested (refer to § 1610.7(b)(1)). Each specimen shall be 50 mm by 150 mm (2 in by 6 in), with the long dimension in the direction in which burning is most rapid as established in the preliminary trials. Be careful not to make any identifying marks in the exposed area to be tested.

(iii) *Mount specimens.* Specimens shall be placed in the holders, with the side to be burned face up. Even though plain surface textile fabrics are not brushed, all specimens shall be mounted in a specimen holder placed on the carriage that rides on the brushing device to ensure proper position in the