

## Specified Requirements of Flame-Resistant Textile

**Document No. FTTS-FA-015**

**Version: 1.0**

### 1. Purpose and Scope

This criterion is applicable to evaluation and testing of flame-resistant ability for general clothing 、 children’s sleepwear 、 home furnishing 、 curtain 、 camp.

### 2. Terminology:

- 2.1 Ignition time: The time for which the igniting flame is applied to the test specimen.
- 2.2 After-flame time: The length of time which a material continues to flame, under specified test conditions, after the ignition source has been removed.
- 2.3 After-glow time: The time for which a material continues to glow, under specified test conditions, after cessation of flaming or after removal of the ignition source, ignoring glowing debris.
- 2.4 Duration of burning: The length of time which a material continues burning, under specified test conditions, after the ignition source has been removed.
- 2.5 Char area: The area which the specimen been burned into char
- 2.6 Char length: The longest length of char area

3. Others\* represent all other objects excluding general clothing and children’s sleepwear; # means mass burning rate test is an addition

TYPE	Grade	Average burning speed	
		Plain surface	Raise-fiber surface
I General clothing textile	1	4 Sec or above	Above 7 Sec
	2		0~7Sec without flame, melting
		---	4~7Sec and with flame, melting

Refer to CPSC 16 CFR Part 1610

TYPE	Grade	Char Length	
		Individual	Average
I Children’s sleepwear	Qualify	All below 25.4cm(10 inches);or	No exceed 17.8cm(7.0 inches)

Refer to CPSC 16 CFR Part 1615/1616

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TYPE	Grade	Fabric weight below 450g/m <sup>2</sup> (A-1 method)							
		Ignition time: 1 min				3 sec after ignition			
		Char Area (cm <sup>2</sup> )	After Flame Time (Sec)	After Glow time (Sec)	Char Distance (cm)	Char Area (cm <sup>2</sup> )	After Flame Time (Sec)	After Glow time (Sec)	Char Length (cm)
III (Others*/Republic Of China)	1	Below 30	Below 3	Below 5	Below 20	Below 30	Below 3	Below 5	Below 20
	2	Below 45			Above 20	Below 45	Below 10	Below 15	Above 20

Refer to CNS 10285 L3196 A-1 method

TYPE	Grade	Fabric weight above 450g/m <sup>2</sup> (A-2 method)							
		Ignition time: 2 min				6 sec after ignition			
		Char Area (cm <sup>2</sup> )	After Flame Time (Sec)	After Glow time (Sec)	Char Distance (cm)	Char Area (cm <sup>2</sup> )	After Flame Time (Sec)	After Glow time (Sec)	Char Length (cm)
III (Others*/Republic Of China)	1	Below 40	Below 5	Below 20	Below 20	Below 40	Below 5	Below 20	Below 20
	2	Below 60			Above 20	Below 60	Below 20	Below 30	Above 20

Refer to CNS 10285 L3196 A-2 method

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TYPE	Grade	Fabric Weight (g/m <sup>2</sup> )	Individual Fame time (Sec)	Average Flame time (Sec)	Individual Char length (mm)	Average char length (mm)
IV (Others*/United States of America)	Qualify	Above 340	4	2	255	115
		270-340			255	140
		200-270			255	165
		135-200			255	190
		50-135 (below 100#)			255#	215#(below 5%)
		Below 50#			255#	230#(below 5%)

Refer to CPAI-84 Sec. 6

TYPE	Grade	Flame Spread rate (mm/s)	After Flame Time (Sec)	After Glow Time (Sec)	Char length (mm)	Melting
V (Others*/Europe or international)	Qualify	0	None wash Below 3; After 3 washes Below 20	Below 25	Below 150	none

**4. Test method :**

- 4.1 General clothing textiles : Determination of burning speed , the test angle is 45 degree ° Refer to CPSC 16 CFR Part 1610.
- 4.1.1 Durability: Wash 20 times according to AATCC 135(1)(III)(A)iii.
- 4.1.2 Preparation of test specimen: Five specimens, each measuring

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50 mmX150 mm (2 inX6 in), are required for each test. The test direction and surface of specimen should be that in which the burn most rapidly in preliminary test ◦ If the specimens in the preliminary test do not ignite or are every slow burning, or have a fire retarding finish, and sample need to be subjected to the dry cleaning and washing procedures.

**4.1.3 Testing procedure:**

4.1.3.1 Each specimen having a raised-fiber surface, in its original condition or after dry cleaning and washing, is placed on the brushing device carriage and drawn under the brush once against the lay of the raised-fiber surface. Other specimens do not require brushing. All specimens are clamped individually in the specimen holders of the flammability tester. The specimen then are dried in an oven for 30 minutes at  $105\pm 2^{\circ}\text{C}$ , removed from the oven, and placed in a desiccators until cool, but for not less than 15 minutes.

4.1.3.2 Adjust the flame to a length of 5/8 inch.

4.1.3.3 Remove the mounted specimen from the desiccators and place it in a position on the 4.1.3.4 rack into chamber of the apparatus. The stop cord (No.50 cotton sewing thread) is strung through of this section. Bring the starting lever over to the extreme right and release it. this starts the timing mechanism and applies the flame to the specimen for a period of 1 second. This should be done within 45 seconds of the time the specimen was removed form the desiccators. Timing is automatic, starting upon application of the flame and ending when the weight is released by the burning of the stop cord. If the time of flame of flame spread is less than 4 seconds of if the specimens do not burn, test 5 additional specimens.

4.1.4 The time of flame spread is then taken to be the average time except the specimen did not burn or the flam distinguish before reach the stop cord.

4.2 Children's sleepwear: A vertical flammability test. Refer to CPSC 16 CFR Part 1615/1616.

4.2.1 Durability : Wash 50 times according to AATCC 124 at  $60^{\circ}\text{C}$  ◦

4.2.2 Preparation of test specimen: Totally 10 specimens in original and after durability wash states.

specimen size : 89 mm X 254 mm

Original state : cut 2 (or 3) specimens in length and 3 (or 2) specimens in width direction from the beginning and the end of fabric respectively. After durability wash: cut 2 (or 3) specimens in length and 3 (or 2) specimens in width direction from the beginning and the end of fabric respectively.

4.2.3 Testing procedure:

4.2.3.1 Put the specimen into an oven for 30 minutes at  $105\pm 2^{\circ}\text{C}$  , removed from the oven, and placed in a desiccators to cool for 30-60 minutes ◦

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4.2.3.2 Adjust the flame ( at least 97% pure methane ) to a length of 38 mm ◦

4.2.3.3 Remove the specimens form the desiccators and suspended in the cabinet for testing.

The burner flame impinged on the bottom edge of the specimen for 3.0±0.2 seconds. When flame impingement, remove the specimen form the cabinet and holder. Insert a hook with the correct weight as shown in below table in the specimen on one side of the charred area. Tear the specimen by grasping the other lower corner of the fabric and gently raising the specimen and weight clear of the supporting surface. Measure the char length as the distance from the end of the tear to the edge of the specimen exposed to the flame. Five additional specimen should be tested form the same end of fabric if only one specimen char length equal to 25.4 cm.

Fabric weight	Dead weight
Less than 101 g/m2 (3 oz/yd2)	54.4 g (0.12 lb)
101-207 g/m2 (3-6 oz/yd2)	113.4 g (0.25 lb)
207-338 g/m2 (6-10 oz/yd2)	226.8 g (0.50 lb)
Greater than 338 g/m2 (10 oz/yd2)	340.2 g (0.75 lb)

4.2.3.4 Report the value of char length for each specimen, as well as the average char length for each set of five specimens.

4.3 Other textile fabric/ROC: test angle is 45 degree ◦ Refer to CNS 10285 L3196 A-1 or A-2 (depend on fabric weight) and Flame-Resistance testing standard of Ministry of the Interior ◦

4.3.1 Durability : Depend on the needs, wash 5 cycles of 60±2°C for 15 minutes according to CNS 8038 method F2 ◦

4.3.2 Preparation of test specimen: Cut enough specimens from original and /or washed samples both in warp(length) and weft (width) directions. Size: 350 mm x 250 mm.

4.3.3 Testing procedure:

4.3.3.1 Put the specimen into an oven for 24 hours at 50±2°C , removed from the oven, and placed in a desiccators to cool for 2 hours ◦

4.3.3.2 Adjust the flame ( mainly butane and butane ) to a length of 45 mm for A-1, 65 mm for A-2 ◦

4.3.3.3 Three steps :

(1) Step 1: Flame application time 1 minutes for A-1 or 2 minutes for A-2, measure After-flame time, After-flow time and char area, take 3 specimens both in warp(length) and weft (width) directions.

(2)Step 2 (with ignited): Flame application time 3 seconds for A-1 or 6 seconds for A-2 after ignited, measure After-flame time, Afterglow time and char area, take 2

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specimens both in warp(length) and weft (width) directions.

(3)Step 3(with melting): Make the specimen in 5% more loss, repeat step1 and 2, measure After-flame time, Afterglow time, char area and char length.

4.3.4 Report the maximum value of after-flame time, afterglow time, char area and char length.

4.4 Other textile fabric/US: A vertical flammability test. Refer to CPAI-84 Section 6 °

4.4.1 Durability: The specimens shall be immersed in water for 72 hours then air-dried. The water shall be changed by a continuous flow or by emptying and refilling every 12 hours.

4.4.2 Preparation of test specimen: Cut 4 specimens from original and /or washed samples both in warp(length) and weft (width) directions. Size: 70 mm x 300 mm.

4.4.3 Testing procedure:

(1) Put specimen in standard atmospheric conditions.

(2) Adjust the flame ( at least 97% pure methane ) to a length of 38 mm.

(3) Removed the specimen from standard atmospheric conditions and mounted in sample holder, than suspended vertically in the cabinet. The burner flame applied for 12 seconds. After flaming and glowing have ceased, removed the tested specimen from cabinet, Insert a hook with the correct weight as shown in below table in the specimen on one side of the charred area. Tear the specimen by grasping the other lower corner of the fabric and gently raising the specimen and weight clear of the supporting surface. Measure the char length as the distance from the end of the tear to the edge of the specimen exposed to the flame.

Fabric weight	Dead weight
less than 100 g/m <sup>2</sup>	50 g
100-200 g/m <sup>2</sup>	100 g
200-340 g/m <sup>2</sup>	200 g
greater than 340 g/m <sup>2</sup>	350 g

\* CPAI-84 Sec.6

4.4.4 Report the after-flame time and char length in individual and average results. Loss weight percentage should be reported as well for fabric weight less than 100 g/m<sup>2</sup>.

4.5 Other textile fabric/ISO : A vertical flammability test. Refer to EN 1103 (Apparel only) and ISO 6941 °

4.5.1 Durability : Cleaning procedure should according to the given care label, if no cleansing procedure is prescribed, washing condition 6A (40°C x 6 minutes) of EN 26330 (ISO 6330-1984) should be used ° Wash 20 times for Apparel; 5 times for others.

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4.5.2 Preparation of test specimen : Cut 3 specimens from original and /or washed samples both in warp(length) and weft (width) directions. Size : 560 mm x 170 mm ◦ Wash once for un-washed garment according the given care label. if no cleansing procedure is prescribed, washing condition 6A (40°C x 6 minutes) of EN 26330 (ISO 6330-1984) should be used

4.5.3 Testing procedure :

- (1) Condition the test specimen at least 24 hours in the standard atmosphere.
- (2) Adjust the flame ( propane ) to a length of 40 mm ◦
- (3) Flame application time is 10 seconds.

Ignite position :

apparel textile - ignite on the surface of specimen.

curtains and drapes - ignite on the surface of specimen. If cannot ignite then ignite on the bottom edge of specimen.

Campers : ignite the bottom edge of specimen.

4.5.4 Report the follows:

- (1) the time from the start of the application of the test flame until the severance of the 1<sup>st</sup> and 3<sup>rd</sup> marker thread;
- (2) record the time form the severance of the 1<sup>st</sup> to the 3<sup>rd</sup> marker thread to obtain the burning speed; record the after-flame time if the 3<sup>rd</sup> marker thread did not burnout.

5. Mark

As above

6. Reference

CPSC 16 CFR Part 1610 Flammability of clothing textiles

CPSC 16 CFR Part 1615/1616 Flammability of children's sleepwear

AATCC 135 Dimensional changes in home launderings

AATCC 124 Appearance of fabrics after repeated home launderings

CNS 10285 L3196 Fiber products flammability test method

CNS 8038 L3138 Textile dimensional changes test method

CPAI-84 A Specification for flame-resistant material used in camping tentage

EN 1103 Detailed procedure to determine the burning behavior of fabrics for apparel

ISO 6941 Measurement of flame spread properties of vertically oriented specimens

EN 26330 (ISO 6330-1984) Domestic washing and drying procedures for textile testing

Swiss official regulation Brennbarkeitsverordnung, BrbV 817.043.1

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