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**Protective clothing - Flame retardant protective
clothing**

防护服装 阻燃服

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Protective clothing - Flame retardant protective clothing

1 Scope

This Standard specifies the classification, requirements, test methods, inspection rules, identification, packaging and storage of flame-retardant protective clothing.

This Standard applies to flame retardant protective clothing that is used in places where there are open flames, sparks, or where there are flammable substances and flashover risks.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 250, Textiles - Tests for colour fastness - Grey scale for assessing change in colour

GB/T 2912.1, Textiles - Determination of formaldehyde - Part 1: Free and hydrolyzed formaldehyde (water extraction method)

GB/T 3291.3, Textiles - Terms of textile material properties and test - Part 3: General

GB/T 3916-2013, Textiles - Yarns from packages - Determination of single-end breaking force and elongation at break using constant rate of extension (CRE) tester

GB/T 3917.3, Textiles - Tear properties of fabrics - Part 3: Determination of tear force of trapezoid-shaped test specimens

GB/T 3920, Textiles - Tests for colour fastness - Colour fastness to rubbing

GB/T 3921, Textiles - Tests for colour fastness - Colour fastness to washing with soap or soap and soda

GB/T 3922, Textiles - Tests for colour fastness - Colour fastness to perspiration

GB/T 3923.1, Textiles - Tensile properties of fabrics - Part 1: Determination of maximum force and elongation at maximum force using the strip method

GB/T 4802.1, Textiles - Determination of fabric propensity for fuzzing and pilling - Part 1: Circular locus method

GB/T 4802.3, Textiles - Determination of fabric propensity to surface fuzzing and to pilling - Part 3: Pilling box method

GB/T 5296.4, Instructions for use of products of consumer interest - Part 4: Textiles and apparel

GB/T 5453, Textiles - Determination of the permeability of fabrics to air

GB/T 5455-2014, Textiles - Burning behaviour - Determination of damaged length, afterglow time and afterflame time of vertically oriented specimens

GB/T 7573, Textiles - Determination of pH of aqueous extract

GB/T 7742.1, Textiles - Bursting properties of fabrics - Part 1: Hydraulic method for determination of bursting strength and bursting distension

GB/T 8628, Textiles - Preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change

GB/T 8629-2017, Textiles - Domestic washing and drying procedures for textile testing

GB/T 8630, Textiles - Determination of dimensional change in washing and drying

GB/T 12704.1, Textiles - Test method for water-vapour transmission of fabrics - Part 1: Desiccant method

GB/T 12903, Personal protective equipment terminology

GB/T 13640, Size designation of protective clothing

GB/T 17592, Textiles - Determination of the banned azo colourants

GB 18401-2010, National general safety technical code for textile products

GB/T 20097, Protective clothing - General requirements

GB 20653, High-visibility warning clothing for professional use

GB/T 21294, Testing methods of physical and chemical performance of garments

damaged area. In the damaged area, some areas will produce red heat due to the continuous release of the previously absorbed heat, and the duration of the red heat is not included in the afterflow time.

Note 3: Rewrite GB/T 3291.3-1997, definition 2.146.

3.4 Damaged length

Under the specified test conditions, the maximum length of the damaged part of the material in the specified direction.

Note 1: In millimeters (mm).

Note 2: Rewrite GB/T 3291.3-1997, definition 2.157.

3.5 Thermal protective performance; TPP

In the process of testing the thermal protective material, the cumulative energy that is determined by the intersection of the measured heat transfer reaction curve of the material over the cumulative time and the Stoll curve.

Note 1: In kilowatt second per square meter ($\text{kW}\cdot\text{s}/\text{m}^2$).

Note 2: Rewrite GB/T 38302-2019, definition 3.1.

3.6 Inherent flame-retardant fabric

Without any flame retardant after treatment, the flame-retardant fabric that has the corresponding level of flame-retardant performance only through the flame-retardant fiber material or the combination of flame-retardant fiber materials that constitute the fabric.

3.7 After treatment flame retardant fabric

The fabric that has the flame-retardant performance by chemically treating fibers, yarns, and fabrics that do not have or are insufficient in flame retardant performance.

3.8 Outer shell/layer

The material that is used for the outermost layer of the clothing.

3.9 Lining

The material that is used to cover the inner surface of the clothing completely or partially in the innermost layer of the clothing.

dressing part shall not leak glue. After washing 20 times according to 4 N method in GB/T 8629-2017, there shall be no blistering or delamination.

5.2 Style

The style shall be simple, practical, and beautiful, and shall be selected from the following styles:

Separate top and bottom clothing, trousers (cap) one-piece, etc.

5.3 Structure

5.3.1 When the tester wears clothing of the same size to perform the following actions, the clothing shall always cover the torso and limbs; the waist, abdomen, forearms, wrists, legs and other parts that are covered by the clothing shall not be exposed.

- a) Keep the body upright; raise the arms horizontally until the arms are above the head;
- b) Stand upright; stretch the arms forward; continue to lift high over the head; then, bend down until the fingers touch the ground;
- c) Stretch the arms forward; squat down; stand up;
- d) Advance junte.

5.3.2 The exposed pocket shall be covered with a flap; the length of the jacket shall cover the upper end of the trousers by more than 20 cm; the cuffs, leg openings and collar shall be closed; the length of the flap shall be greater than the length of the pocket by 2 cm. The pockets on both sides of the trousers must not have slant pockets, so as to avoid sloping up and overturning.

5.3.3 It is not easy to cause hooking, hanging, twisting and grinding during operation.

5.3.4 Leave breathable pores in suitable places, to perspire and regulate body temperature. However, the ventilation holes must not affect the strength of the clothing; the pore structure must not allow foreign objects to enter the interior of the clothing.

5.4 Size and specifications

The size of the protective clothing shall meet the requirements of GB/T 13640; the range beyond GB/T 13640 shall be set by the grade difference. The allowable tolerances of the finished product size measurement position and main parts comply with the regulations of FZ/T 81007.

outer shell in this Standard; use the normal stirring method to wash for 12.5 h; rinse for 8 h; hang to dry. Change the water twice during the rinsing process; dehydrate for 2 minutes before each water change. The washing powder that is used for washing shall be neutral, with a pH value of 7.0 ~ 7.5. Or use the A2 automatic washing machine and use neutral detergent to wash 50 times according to the 4N method in GB/T 8629-2017; hang to dry. If the clothing is marked as disposable clothing, it can be tested without the washing pre-treatment.

6.3 Test the breaking force of the outer shell according to GB/T 3923.1.

6.4 Test the tear strength of the outer shell according to GB/T 3917.3.

6.5 Test the bursting strength of the outer shell according to the method that is specified in GB/T 7742.1; the test area is 7.3 cm².

6.6 Test the moisture permeability of the outer shell according to the method that is specified in GB/T 12704.1.

6.7 The pilling test of woven fabrics shall be carried out in accordance with the provisions of GB/T 4802.1; the pilling test of knitted fabrics shall be carried out in accordance with the provisions of GB/T 4802.3.

6.8 Test the air permeability of the outer shell according to the provisions of GB/T 5453.

6.9 The size change rate and slack size change rate of the outer shell shall be carried out in accordance with the provisions of GB/T 8628 and GB/T 8630. Use the 4N program in GB/T 8629-2017 to wash; for the woven fabric, use the hanging and drying method to dry; for the knitted fabric, use the spreading and drying method to dry. If the instructions for use are gentle washing or hand washing, use the 4G or 4H program to wash, and the number of washes is 1 time.

6.10 The thermal stability test method of outer shell and lining shall be carried out in accordance with Appendix A. Test Grade-A at (260±5) °C, and Grade-B at (180±2) °C.

6.11 Perform the test of color fastness to washing with soap or soap and soda according to provisions of GB/T 3921.

6.12 Perform the test of color fastness to rubbing according to provisions of GB/T 3920.

6.13 Perform the test of color fastness to perspiration according to provisions of GB/T 3922.

Flame retardant performance of finished products under flashover conditions	A
Marking	A
Package	B
Note: During the type inspection, the formaldehyde content, pH value, resoluble carcinogenic aromatic amine dyes, and odor are only tested for finished clothing.	

7.2 Each quality defect is calculated cumulatively according to Table 5; the qualification conditions for a single product: the number of type A defects = 0, the number of type B defects = 0, the number of type C defects ≤ 2 ; or the number of type A defects = 0, the number of type B defects ≤ 1 , the number of type C defects ≤ 1 .

8 Identification, packaging and storage

8.1 Identification

8.1.1 Each set of protective clothing shall have a permanent mark, including a certificate of quality, instructions for use and graphic symbols.

8.1.2 The content of the certificate shall include the product name, product category, material composition, description of the material being inherent flame retardant fabric or after treatment flame retardant fabric, protection grade, washing method, production date, batch, validity period, manufacturer name, factory address; disposable clothing shall be marked "not washable".

8.1.3 The product shall be accompanied by instructions for use, which shall meet the requirements of GB/T 5296.4 and include the following contents:

- a) Product washing method, maximum washing times and shelf life requirements.
- b) If the clothing contains multiple parts or the clothing is composed of several pieces of clothing, each part and each layer of clothing shall be clearly marked to ensure the correct order of the inner and outer layers of the clothing.
- c) It is stated that after contact with chemicals or flammable liquids, users shall leave the workplace immediately, and take off work clothes carefully, and try to avoid chemical or liquid contact with the skin.
- d) It shall be noted that in some cases, other personal protective equipment are also required.
- e) It shall explain other risks that may be encountered during use due to the performance limitations of the clothing itself.

Appendix A

(Normative)

Thermal stability test method

A.1 Sample

The sample size is 100 mm × 100 mm. If the flame-retardant protective clothing has multiple layers, it shall be tested as a whole. The number of samples is 6 pieces, of which 3 pieces are unwashed samples, and 3 pieces are samples after washing in accordance with the provisions of this Standard. If the sample cannot be washed, the number of samples is 3 pieces.

A.2 Test device

A.2.1 Drying box

Temperature range: 20 °C ~ 300 °C;

Temperature fluctuation: ±2.0 °C;

There is enough volume to place the test sample alone.

A.2.2 Measuring ruler

Use a millimeter scale whose total length is not more than 1 m.

A.3 Test preparation

Keep the sample for 24 h under a standard atmospheric pressure, the temperature of (20±2) °C and the relative humidity of (65±5)%.

A.4 Test steps

Heat the drying box to the required temperature: Grade-A of (260±5) °C, Grade-B of (180±2) °C; quickly put the hanging sample into the drying box; the sample shall not contact the wall of the drying box; close the door of the drying box and start to record the time; open the door of the drying oven after 5 minutes; take out the sample. The sample shall be measured within 2 min in the length and width directions under normal temperature environment. Calculate the maximum dimensional change rate according to Formula (A.1); take the average of 3 samples as the test result.

$$P = |(D_1 - D_2)/D_1| \times 100\% \quad \dots\dots\dots (A.1)$$

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Accountable person and shareholder: Wayne Zheng

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Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

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