Designation: F2302 – 22

Standard Performance Specification for Labeling Protective Clothing Which Provides Resistance to Incidental Exposures to Heat or Open Flame[1]

This standard is issued under the fixed designation F2302; 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 specification provides minimum requirements for labeling protective clothing offering heat, flame, and melting resistance for applications where the potential exists for incidental exposure to open flame, radiant heat sources, or hot surfaces which could melt or ignite materials.

1.1.1 Examples of possible applications for this specification include safety apparel, including high-visibility safety apparel, in situations where the possibility exists for accidental contact with hot surfaces, radiant heat sources, or an open flame; clothing worn by individuals for chemical, liquid, or particle protection where the possibility exists for clothing to similarly contact a burner or similar low-intensity flame source; or other clothing worn by individuals that comes in contact with torch flames, hot piping, or other surfaces that melt, degrade, or ignite clothing materials by proximity or contact.

1.1.2 This specification is not to be used for separate claims for flame resistance ("FR"), heat resistance, or protection against the transfer of thermal energy. Instead, clothing materials are required to be evaluated for the combination of flame and heat resistance tests.

1.1.3 This specification does not include a test for establishing protection levels against specific hazards where clothing insulation is needed such as from flash fires, exposure to high-energy electrical arc, or extended duration fires. This specification does not replace and shall not be used in lieu of existing standards where well-defined criteria are established for protection of workers from known characterized intense thermal hazards such as flash fires (NFPA 2112), high-energy electrical arc (Specification F1506), or wildland firefighting (NFPA 1977). See Appendix X1 for a list of standards for heat and flame-resistant protective clothing.

1.1.4 This specification includes requirements that define resistance to melting and combustion of materials used in personal protective clothing in a manner to limit the contribution of the clothing for causing injury to the wearer when exposed to low levels of heat or flame. The primary mechanisms by which a garment can contribute to injury are by the garment igniting and supporting combustion, and if the garment melts onto the wearer's skin.

1.1.5 This specification is applicable to all materials used in the construction of the protective clothing, including lining materials and materials that contact the skin or underclothing of the wearer. Exclusions are permitted for some materials such as labels and small components that do not come in contact with the wearer's skin or underclothing.

1.1.6 This specification does not include testing for the evaluation of the entire clothing item.

1.1.7 This specification does not include procedures for testing of gloves or footwear.

1.1.8 This specification is applicable to hoods, balaclavas, shrouds, neck gaiters, barrier face coverings, and other items of apparel that are primarily worn on the individual wearer's head.

1.2 This specification does not apply to protective clothing that is addressed in other standards for specific applications including electrical arc flash, flash fire, and various types of firefighting or emergency response. See Appendix X1 for a list of standards for heat and flame-resistant protective clothing.

1.3 The values stated in SI units or in other units shall be regarded separately as standard. The values stated in each system must be used independently of the other, without combining values in any way.

1.4 This standard measures and describes the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.

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] This specification is under the jurisdiction of ASTM Committee F23 on Personal Protective Clothing and Equipment and is the direct responsibility of Subcommittee F23.80 on Flame and Thermal.

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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]

D123 Terminology Relating to Textiles

D4391 Terminology Relating to The Burning Behavior of Textiles

D6413/D6413M Test Method for Flame Resistance of Textiles (Vertical Test)

D7138 Test Method to Determine Melting Temperature of Synthetic Fibers

E171/E171M Practice for Conditioning and Testing Flexible Barrier Packaging

F1358 Test Method for Effects of Flame Impingement on Materials Used in Protective Clothing Not Designated Primarily for Flame Resistance

F1494 Terminology Relating to Protective Clothing

F1506 Performance Specification for Flame Resistant and Electric Arc Rated Protective Clothing Worn by Workers Exposed to Flames and Electric Arcs

F2101 Test Method for Evaluating the Bacterial Filtration Efficiency (BFE) of Medical Face Mask Materials, Using a Biological Aerosol of *Staphylococcus aureus*

F2299/F2299M Test Method for Determining the Initial Efficiency of Materials Used in Medical Face Masks to Penetration by Particulates Using Latex Spheres

F2894 Test Method for Evaluation of Materials, Protective Clothing, and Equipment for Heat Resistance Using a Hot Air Circulating Oven

2.2 *AATCC Standards:*[3]

AATCC 132 Colorfastness to Drycleaning

AATCC 135 Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics

2.3 *NFPA Standard:*[4]

NFPA 1977 Protective Clothing and Equipment for Wildland Fire Fighting

2.4 *European Standard:*[5]

EN 14683 Medical Face Masks—Requirements and Test Methods

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification related to the combustion of textiles, refer to the terminology contained in Terminology D4391. For definitions of terms used in this specification related to protective clothing, refer to the terminology contained in Terminology F1494. For definitions of terms used in this specification related to textile issues, refer to the terminology contained in Terminology D123.

3.2 *afterflame, n*—persistent flaming of a material after the ignition source has been removed.

3.3 *afterflame time, n*—the length of time for which a material continues to flame after the ignition source has been removed.

3.4 *afterglow, n*—a glow in a material after the removal of an external ignition source, after the cessation (natural or induced) of flaming of the material (see also *glow*).

3.5 *barrier face covering, n*—an item of clothing, primarily covering the nose and mouth, designed to reduce the community spread of bioaerosols.

3.5.1 *Discussion*—These clothing items are primarily intended to attenuate the volume of bioaerosols that are exhaled or released during coughing and sneezing by the individual wearer to aid in lessening the transmission of airborne pathogens such as SARS-CoV-2, the virus responsible for COVID-19. These clothing items are not protective masks or medical masks and are not evaluated for their protective performance in accordance with this standard.

3.6 *burn distance, n*—the measurement from the bottom edge of the specimen to the farthest point that shows evidence of damage due to combustion.

3.6.1 *Discussion*—In this specification, burn distance is used when testing is performed in accordance with Test Method F1358.

3.7 *burning behavior, n*—all the changes that take place when materials or products are exposed to a specified ignition source.

3.8 *char length, n*—in measuring flame resistance of textiles, the distance from the fabric edge which is directly exposed to the flame to the furthest point of visible fabric damage after a specified tearing force has been applied.

3.8.1 *Discussion*—In this specification, char length is reported when testing is performed in accordance with Test Method D6413/D6413M.

3.9 *charring, n*—the formation of carbonaceous residue as the result of pyrolysis or incomplete combustion.

3.10 *combustion, n*—a chemical process of oxidation that occurs at a rate fast enough to produce heat and usually light either as glow or flames.

3.11 *dripping, n*—a material response evidenced by flowing of the polymer.

3.11.1 *Discussion*—In evaluating the effects of flame contact or heat exposure of materials used in protective clothing, dripping may be the formation of liquid droplets from melted surface or substrate material during flame impingement or high heat exposure.

3.12 *embrittlement, n*—the formation of a brittle residue as the result of pyrolysis or incomplete combustion.

[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 American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

[4] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.

[5] Available from British Standards Institution (BSI), 389 Chiswick High Rd., London W4 4AL, U.K., http://www.bsigroup.com.