Designation: F 1939 – 99a

Standard Test Method for Radiant Protective Performance of Flame Resistant Clothing Materials[1]

This standard is issued under the fixed designation F 1939; 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 test method covers a means of measuring the effect of radiant heat exposure at the standard levels of (*a*) 0.5 or (*b*) 2.0 cal/cm^2 ·s (21 or 84 kW/m^2) on a fabric specimen or a fabric assembly specimen.

1.2 The radiant protective performance (RPP) rating is calculated.

1.2.1 This value is not intended to be used as a performance specification.

1.2.2 The effects of the radiant energy exposure on the specimen may be observed and reported.

1.3 This test method is recommended for use with fabrics that are flame resistant and that are used in the manufacture of protective clothing.

1.4 This test method is not recommended for use with fabrics or with other textile materials that are not flame resistant, and that may or may not ignite and continue to burn from exposure to the radiant heat flux.

1.5 This test method 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.

1.6 The values stated in customary units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units.

1.7 *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. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[2]

D 1776 Practice for Conditioning Textiles for Testing[2]

E 457 Test Method for Measuring Heat-Transfer Rate Using a Thermal Capacitance (Slug) Calorimeter[3]

F 1494 Terminology Relating to Protective Clothing[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *break-open*, *n—in testing thermal protective materials*, response evidenced by the formation of a hole in the material during the thermal exposure that may result in direct contact of the heat sensor with the exposure energy.

3.1.2 *burn injury*, *n*—burn damage that occurs at various levels of depth within human tissue.

3.1.2.1 *Discussion*—Burn injury in human tissue occurs when the tissue is heated and kept at an elevated temperature for a critical period of time. The amount of burn injury, first-, second-, or third-degree depends upon both the level of the elevated temperature and the duration of time. Material performance in this test method is related to the second-degree burn injury and is determined by the amount of thermal energy transmitted through the specimen that is sufficient to cause a second-degree burn. A second-degree burn involves irreversible damage of the epidermis/dermis interface.

3.1.3 *burn time intersection*, *n— in testing of thermal protective materials*, the point where the energy transferred through the specimen and the energy required to predict a second-degree burn are equal, as indicated by the point where the sensor response curve on the recorder chart crosses the curve of the human tissue burn tolerance criteria overlay; or if the data are processed with a computer software program, a similar result achieved by comparison of the heat transferred through the specimen and the human tissue tolerance to heat.

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

3.1.5 *dripping*, *n*—a material response evidenced by flowing and formation of falling droplets.

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

[1] This test method is under the jurisdiction of ASTM Committee F-23 on Protective Clothing and is the direct responsibility of Subcommittee F23.80 on Radiant Energy Exposure Test.

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[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] *Annual Book of ASTM Standards*, Vol 15.03.

[4] *Annual Book of ASTM Standards*, Vol 11.03.

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