



Standard Test Method for Radiant Heat Resistance of Flame Resistant Clothing Materials with Continuous Heating¹

This standard is issued under the fixed designation F1939; 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 rates the non-steady state thermal resistance or insulating characteristics of flame resistant clothing materials subjected to a continuous, standardized radiant heat exposure.

1.1.1 This test method is not applicable to clothing materials that are not flame resistant.

NOTE 1—The determination of a clothing material's flame resistance shall be made prior to testing and done in accordance with the applicable performance standard, specification standard, or both, for the clothing material's end-use.

1.1.2 This test method does not predict skin burn injury from the standardized radiant heat exposure as it does not account for the thermal energy contained in the test specimen after the exposure has ceased.

NOTE 2—See [Appendix X4](#) for additional information regarding this test method and predicted skin burn injury.

1.2 This test method is used to measure and describe the response of materials, products, or assemblies to heat 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.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound or other units that are commonly used for thermal testing.

1.4 *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.*

¹ This test method 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.

Current edition approved Feb. 1, 2015. Published February 2015. Originally approved in 1999. Last previous edition approved in 2008 as F1939 - 08. DOI: 10.1520/F1939-15.

2. Referenced Documents

2.1 ASTM Standards:²

- [D123 Terminology Relating to Textiles](#)
- [D1776 Practice for Conditioning and Testing Textiles](#)
- [D1777 Test Method for Thickness of Textile Materials](#)
- [D3776 Test Methods for Mass Per Unit Area \(Weight\) of Fabric](#)
- [E457 Test Method for Measuring Heat-Transfer Rate Using a Thermal Capacitance \(Slug\) Calorimeter](#)
- [F1494 Terminology Relating to Protective Clothing](#)
- 2.2 *ASTM Special Technical Publication:*

ASTM Report, "ASTM Research Program on Electric Arc Test Method Developments to Evaluate Protective Clothing Fabric; ASTM F18.65.01 Testing Group Report on Arc Testing Analysis of the F1959 Standard Test Method-Phase I"

[ASTM Manual 12 Manual on the Use of Thermocouples in Temperature Measurement](#)

3. Terminology

3.1 Definitions:

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

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

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

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

3.1.5 *heat flux, n*—the thermal intensity indicated by the amount of energy transmitted divided by area and time; kW/m² (cal/cm²s).

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.