



Standard Test Method for Evaluating Heat Transfer through Materials for Protective Clothing Upon Contact with Molten Substances¹

This standard is issued under the fixed designation F 955; 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 the evaluation of materials' thermal resistance to molten substance pour by describing means of measuring heat transfer.

NOTE 1—As used in this test method, the term *molten substance* refers to the three compositions (aluminum, brass, and iron) for which the procedure was validated. The test design may be adapted for use with other substances not validated as part of the test method.

1.2 This test method is applicable to materials from which finished protective apparel articles are made.

1.3 This test method does not measure the flammability of materials, nor is it intended for use in evaluating materials exposed to any other thermal exposure exclusive of the molten substance itself (see Note 1).

1.4 This test method should be used to measure and describe the properties of materials, products, or assemblies in response to molten substance pour under controlled laboratory conditions and should not be used to describe or appraise the thermal hazard or fire risk of materials, products, or assemblies under actual conditions. However, results of this test may be used as elements of a thermal risk assessment which takes into account all the factors that are pertinent to an assessment of the thermal hazard of a particular end use.

1.5 *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.* Specific hazard statements are given in Section 8.

2. Referenced Documents

2.1 ASTM Standards:

D 123 Terminology Relating to Textiles²

E 457 Test Method for Measuring Heat-Transfer Rate Using a Thermal Capacitance (Slug) Calorimeter³

¹ This test method is under the jurisdiction of ASTM Committee F23 on Protective Clothing and is the direct responsibility of Subcommittee F23.80 on Molten Substances.

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

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

F 1494 Terminology Relating to Protective Clothing⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *break-open*—in testing thermal protective material, a response evidenced by the formation of a hole in the material which allows the molten substance to pass through the material.

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

3.1.3 *dripping*—in testing thermal protective material, a response evidenced by flowing of the fiber polymer.

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

3.1.5 *heat flux*—the thermal intensity indicated by the amount of energy transmitted divided by area and time, W/m² (cal/cm² s).

3.1.6 *human tissue burn tolerance*—in the testing of thermal protective materials, the amount of thermal energy predicted to cause a second-degree burn in human tissue.

3.1.7 *ignition*—the initiation of combustion.

3.1.8 *melting*—in testing thermal protective material, a response evidenced by softening of the material, resulting in a nonreversible change.

3.1.9 *response to molten substance pour*—in testing thermal protective material, the observed effect of molten substance contact on textile properties or deterioration of the material.

3.1.10 *shrinkage*—a decrease in one or more dimensions of an object or material.

3.1.11 *thermal end point*—in testing of thermal protective materials, the point of where the copper slug calorimeter sensor response (heat energy measured) intersects with a predicted skin burn injury model.

3.2 For definitions of other textile terms used in this test method, refer to Terminology D 123.

4. Summary of Test Method

4.1 A material specimen is mounted on a vertical incline and is exposed to a molten substance pour of prescribed minimum temperature, volume, pour rate, and vertical height.

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