



Designation: **F1052–09 F1052 – 14**

## Standard Test Method for Pressure Testing Vapor Protective Suits<sup>1</sup>

This standard is issued under the fixed designation F1052; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### INTRODUCTION

Personnel in industry and emergency response can be exposed to numerous chemicals capable of causing harm upon contact with the human body. The deleterious effects of these chemicals can range from acute trauma such as skin irritation and burn, to chronic degenerative disease such as cancer. Since engineering controls may not eliminate all possible exposures, attention is often placed on reducing the potential for direct skin contact through the use of protective clothing.

Protective clothing is available in a variety of constructions, configurations and materials, and is designed to provide various levels of protection against many hazards. Vapor protective suits generally offer the highest level of chemical protection being constructed to prevent contact of solid, liquid, or gaseous chemicals with the wearer. This test method evaluates the integrity and construction of vapor protective suits by way of an internal pressure test.

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Resistance to chemical permeation of materials used in protective clothing should be evaluated by Test Methods F739 for continuous contact and F1383 for intermittent contact (that is, splash), or by Test Method F1407 according to the permeation cup method. Resistance of protective clothing materials to liquid penetration should be determined by Test Method F903.

Physical properties of materials used in the construction of protective clothing can be determined using a variety of test methods, including Test Methods D751 (dimensions, weight, breaking strength, elongation, burst, tear resistance, hydrostatic resistance, coating adhesion, tack-tear, low temperature impact and bend, accelerated aging, blocking, and crush resistance), D2582 (puncture propagation tear), D4157 (abrasion resistance), F392 (flexural fatigue), F1358 (flammability), as well as many others.

### 1. Scope

1.1 This test method measures the ability of a vapor protective suits, including seams, and closures to maintain a fixed, positive pressure.

1.2 This test method does not measure vapor protection of suits. This test method measures the integrity of the suit, glove, foot protection, and visor materials, as well as the seams, and closures of a vapor protective suit. Exhaust valves fitted in the vapor protective suit must be sealed or blocked for this test and therefore are not functionally tested.

1.3 The values as stated in in.-H<sub>2</sub>O (mm-H<sub>2</sub>O) units are to be regarded as the standard.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F23 on Personal Protective Clothing and Equipment and is the direct responsibility of Subcommittee F23.30 on Chemicals.

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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. For specific hazard statements, see Section 7.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

D751 Test Methods for Coated Fabrics

D2582 Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting

D4157 Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)

F392 Test Method for Flex Durability of Flexible Barrier Materials

F739 Test Method for Permeation of Liquids and Gases through Protective Clothing Materials under Conditions of Continuous Contact

F903 Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Liquids

F1154 Practices for Qualitatively Evaluating the Comfort, Fit, Function, and Durability of Protective Ensembles and Ensemble Components

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

F1359 Test Method for Liquid Penetration Resistance of Protective Clothing or Protective Ensembles Under a Shower Spray While on a Mannequin

F1383 Test Method for Permeation of Liquids and Gases through Protective Clothing Materials under Conditions of Intermittent Contact

F1407 Test Method for Resistance of Chemical Protective Clothing Materials to Liquid Permeation—Permeation Cup Method

F2588 Test Method for Man-In-Simulant Test (MIST) for Protective Ensembles

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *protective ensemble, n*—the combination of protective clothing with respiratory protective equipment, hoods, helmets, gloves, boots, communications systems, cooling devices, and other accessories intended to protect the wearer from a potential hazard when worn together.

3.1.2 *protective clothing, n*—item of clothing that is specifically designed and constructed for the intended purpose of isolating all or part of the body from a potential hazard; or, isolating the external environment from contamination by the wearer of the clothing.

3.1.3 *protective suit, n*—an item of protective clothing that at a minimum covers the wearer’s torso, head, arms, and legs.

<https://standards.iteh.ai/catalog/standards/sist/baffb764-1bde-4a84-809c-033965d4e5f9/astm-f1052-14>

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

#### 3.1.3.1 Discussion—

For purposes of this test method, the protective suit is also equipped with a visor, and tightly attached glove and foot protection and exhaust valves. These suits are designed to cover the wearer’s respiratory equipment and provide protection from vapors.

## 4. Summary of Test Method

4.1 The vapor protective suit is visually inspected and modified for the test. A test apparatus is attached to the vapor protective suit (Fig. 1) to permit inflation to the pre-test expansion pressure for removal of wrinkles and creases, and to equalize/stabilize the air temperatures internal and external to the vapor protective suit. The pressure is lowered to the test pressure and monitored for 4 min. If the pressure drop is excessive, the vapor protective suit fails the test and is removed from service. The test is repeated after leak location and repair.

4.2 Pressure testing of vapor protective suits should be conducted at a frequency recommended by the manufacturer but no less often than upon receipt of the garment, after each wearing if the suit is to be reused, and at least annually thereafter.

## 5. Significance and Use

5.1 Workers involved in the production, use, and transportation of liquid and gaseous chemicals can be exposed to numerous compounds capable of causing harm upon contact with the human body. The deleterious effects of these chemicals can range from acute trauma such as skin irritation and burn to chronic degenerative disease such as cancer. Since engineering controls may not eliminate all possible exposures, attention is often placed on reducing the potential for direct skin contact through the use of protective clothing that resists permeation, penetration, and degradation.