~~Designation:F 1116–88(Reapproved 1995)~~ Designation: F 1116 – 03 (Reapproved 2008)

Standard Test Method for ~~Determining Dielectric Strength of Overshoe Footwear~~Determining Dielectric Strength of Dielectric Footwear[1]

This standard is issued under the fixed designation F 1116; 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

~~1.1This test method covers the determination of the dielectric strength of overshoe footwear. Three procedures are provided, the use of which depends upon the portion of the footwear that it is desired to test.~~

~~1.1.1*Procedure A*—Withstand voltage proof test of the sole portion of the overshoe footwear.~~

~~1.1.2*Procedure B*—Withstand voltage proof test of the sole and foot portion of the overshoe footwear.~~

~~1.1.3*Procedure C*—Withstand voltage proof test of the maximum possible portion of the overshoe footwear without permitting flashover between electrodes.~~

~~1.2The use and maintenance of this equipment is beyond the scope of this test method.~~

~~1.3~~

1.1 This test method covers testing to determine the "Dielectric Strength" of dielectric overfoot and overshoe footwear. Testing is done over the maximum possible area of the dielectric footwear without permitting flashover between electrodes.

1.2 The use and maintenance of dielectric footwear is beyond the scope of this test method.

1.3 *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 appear in 5.2.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

F 1117 Specification for Dielectric Footwear

3. ~~Descriptions of Terms Specific to This Standard~~ Terminology

3.1 ~~*sole*—the underside of the boot or rubber that would be in contact with the ground. In this type footwear it is normally one piece and constructed of a molded elastomer.~~

~~3.2*foot portion*—the portion of the footwear below the wearer's ankle bone.~~ Descriptions of Terms Specific to This Standard:

3.1.1 *user— as used in 1.3*, the entity employing the actual worker utilizing the equipment; if no separate employer, then the individual.

3.1.2 *overfoot footwear*—footwear designed to be worn directly over the feet as the only source of foot covering.

3.1.3 *overshoe footwear*—footwear designed to be worn over existing footwear.

4. Significance and Use

~~4.1Electrical contact injuries to workers may involve a current path through the feet of the worker. This test method will determine that overshoe footwear, if provided as additional isolation or insulation, has a particular value of dielectric strength at the time of the test.~~

~~[1] This test method is under the jurisdiction of ASTM Committee F-18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.15 on Worker Personal Equipment.~~

~~Current edition approved Feb. 1, 1988. Published May 1988.~~

[1] This test method is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.15 on Worker Personal Equipment.

Current edition approved April 1, 2008. Published April 2008. Originally approved in 1988. Last previous edition approved in 20038 as F 1116–03.

[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* ~~, Vol 10.01.~~volume information, refer to the standard's Document Summary page on the ASTM website.

4.1 Electrical contact injuries to workers may involve a current path through the feet of the worker. The footwear covered by this specification is dielectrically rated to provide additional insulation and isolation to the wearer. This test method will determine that dielectric footwear has dielectric integrity at the time of the test.

5. Apparatus

5.1 ~~*Electrodes*~~Electrical Test Criteria:

5.1.1 ~~*Procedure A*—The footwear shall be filled with water or conductive metal shot so that the inner sole is completely covered. The footwear shall then be placed in water to such a depth that the under side of the sole is, to the greatest extent practicable, in contact with the water without the water going above the top of any part of the sole. The water or shot inside the footwear forms one test electrode and shall be connected to one terminal of the voltage source by means of a chain or sliding rod that dips into the electrode. The water in the container outside the footwear forms the other electrode and shall be connected directly to the other terminal of the voltage source (see Figs. 1-~~Test Procedure—The footwear shall be immersed in water or other conducting media to a depth where the flashover clearance is consistent with the proof test voltage as listed in Table 1. Since the water or other conducting media inside the footwear forms one test electrode and the water or the other conducting media in the container outside the footwear forms the other electrode, 152 mm or 6 in. of clearance between electrodes consists of 76 mm or 3 in. of clearance from the top of the footwear to the top of the water or other conducting media both inside and outside of the footwear. Water is recommended as the medium for the electrodes to ensure complete coverage of the surfaces of the footwear. Water may wick up the inner lining on certain brands of footwear. To overcome the wicking effect care needs to be taken to keep the inner area above the water dry and conduct the tests promptly after placing the water inside the footwear. The water or other conducting media inside the footwear forms one test electrode and shall be connected to one terminal of the voltage source by means of a metal chain or sliding rod that dips into the electode. The water or other conducting media in the container outside the footwear forms the other electrode and shall be connected directly to the other terminal of the voltage source. Due to the weight of water or other types of electrode media, support racks are needed to secure footwear being tested. The maximum protective area of the footwear shall be tested. Care must be taken to thoroughly dry the inside of the footwear following the test and prior to storage. See Fig. 1 and Fig. 2 ~~4).~~

~~5.1.2*Procedures B and C*—These procedures differ from Procedure A in how much of the overshoe footwear is subjected to the voltage proof test. In Procedure B, the footwear is immersed to a level of the top of the foot, while in Procedure C the footwear is immersed to a depth where the flashover clearance is consistent with the proof test voltage as listed in Table 1. In Procedures B and C, the inner electrode would preferably be water because of the weight of that quantity of shot. Care must therefore be taken to thoroughly dry the inside of the footwear following the proof test and prior to storage or issue.~~ for typical test arrangements for dielectric test of rubbers and boots using water electrodes.

NOTE 1—Water used as electrodes should have a minimum conductance of 0.25 mho.

5.2 ~~Precaution~~*Precautions*—It is recommended that the test apparatus be designed to afford the operator full protection in performance of his duties. Reliable means of de-energizing and grounding the high-voltage circuit shall be provided. It is particularly important to incorporate a positive means of grounding the high-voltage section of the ~~d-c~~dc test apparatus due to the likely presence of high-voltage capacitance charges at the conclusion of the test.

5.3 *Electrical Test Equipment*:

5.3.1 The test equipment used in the dielectric strength or proof tests shall be capable of supplying an essentially stepless and continuously variable voltage to the test specimen. The equipment shall be inspected at least annually to ensure that the general condition of the equipment is acceptable and to verify the characteristics and accuracy of the test voltage.

5.3.2 Breakdown or failure indicators or accessory circuits shall be designed to give positive indication of failure and shall require resetting by the operator before tests can be continued.

5.4 ~~*A-C Tests*~~AC Tests:

5.4.1 *Voltage Supply and Regulation* :

5.4.1.1 The test voltage crest factor shall not differ more than ~~5%~~2 % from a sinusoidal wave.

5.4.1.2 The accuracy of the voltage measuring circuit shall be within ±2 % of ~~full scale.~~ test voltage.

5.5 ~~*D-C Tests*~~DC Tests:

5.5.1 *Voltage Supply and Regulation* :

5.5.1.1 The peak to peak ~~a-c~~ac ripple component of the ~~d-c~~dc proof-test voltage shall not exceed 2 % of the average voltage value under no-load conditions.

TABLE 1 Flashover Clearances Between Electrodes

A-C ~~Proof~~ Test		D-C ~~Proof~~ Test	
Voltage (rms value)	mm (in.)	Voltage (avg value)	mm (in.)
~~5 000~~	~~76 (3)~~	~~20 000~~	~~76 (3)~~
15 000	127 (5)	45 000	152 (6)
~~10 000~~	~~76 (3)~~	~~40 000~~	~~102 (4)~~
~~20 000~~	~~127 (5)~~	~~50 000~~	~~152 (6)~~
20 000	152 (6)	60 000	178 (7)