Designation: ~~F1116 – 14a~~ F1116 – 21

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

This standard is issued under the fixed designation F1116; 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 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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements appear in 5.2.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

F1117 Specification for Dielectric Footwear

3. Terminology

3.1 *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

4.1 Electrical contact injuries to workers may involve a current path through the feet of the worker. The footwear covered by this

[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.

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[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.

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 *Electrical Test Criteria:*

5.1.1 *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 electrode. 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 for typical test arrangements for dielectric test of rubbers and boots using water electrodes.

5.1.1.1 Water used as electrodes shall have a minimum conductance of 100 µS/cm.

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

5.2 ~~*Precautions*—It~~**Warning**—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 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 *AC Tests:*

5.4.1 *Voltage Supply and Regulation:*

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

5.4.1.2 The accuracy of the voltage measuring circuit shall be within ±1 kV of test voltage. The ac voltage applied to the test specimen shall be measured with either an AC voltmeter (RMS or average responding) or a peak responding voltmeter calibrated to pk/SQRT2 using one of the following methods: *(1)* a voltmeter used in conjunction with a calibrated instrument transformer

TABLE 1 Test Voltages and Flashover Clearances Between Electrodes

AC Test		DC Test	
Voltage (rms value)	mm (in.)	Voltage (avg value)	mm (in.)
15 000	127 (5)	45 000	152 (6)
20 000	152 (6)	60 000	178 (7)

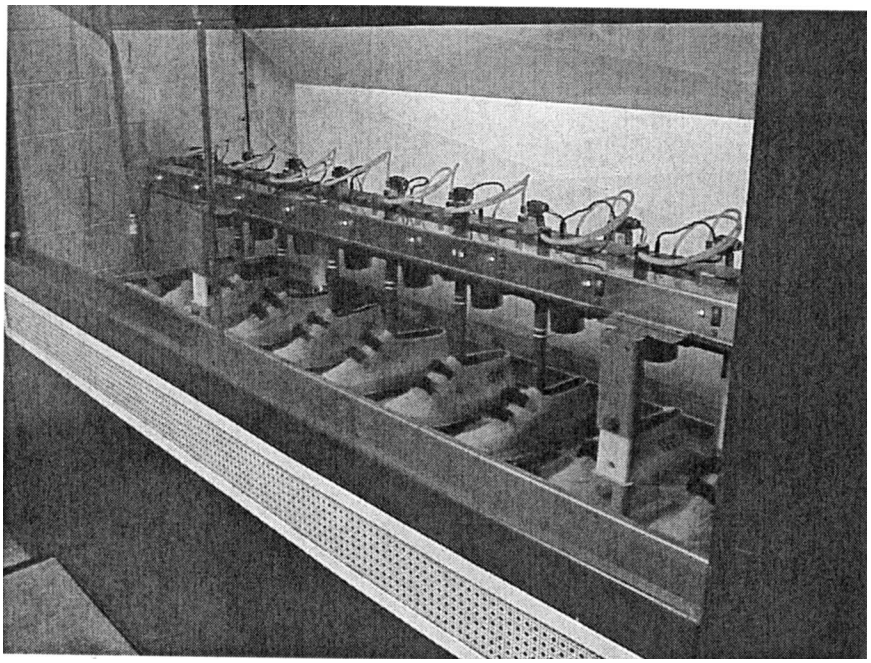

FIG. 1 Typical Test Arrangement for Dielectric Test of Rubbers Using Water Electrodes

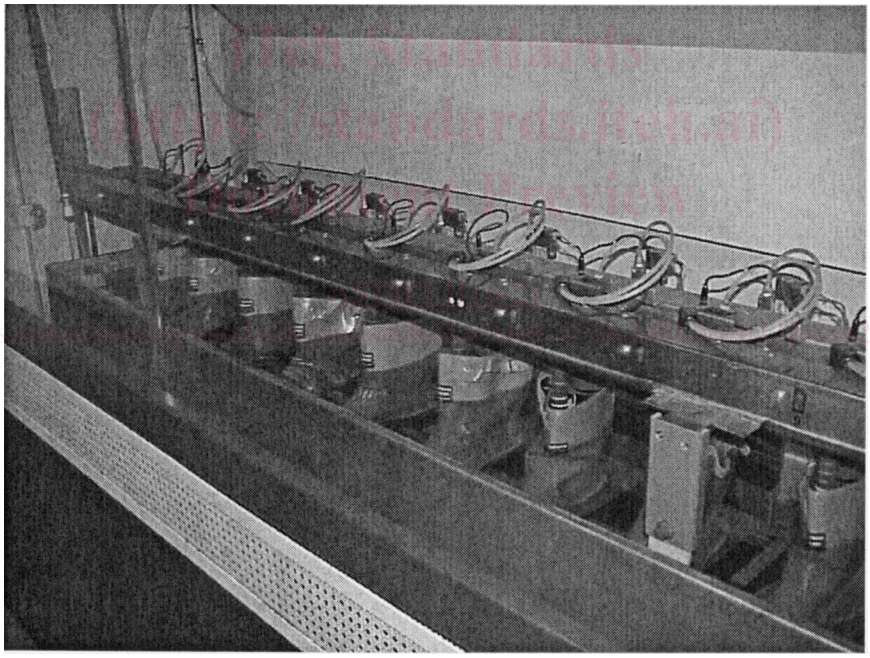

FIG. 2 Typical Test Arrangement for Dielectric Test of Boots Using Water Electrodes

connected directly across the high-voltage circuit, *(2)* a calibrated electrostatic voltmeter connected directly across the high-voltage circuit, or *(3)* an ac meter connected in series with appropriate high-voltage type resistors directly across the high-voltage circuit.

5.5 *DC Tests:*

5.5.1 *Voltage Supply and Regulation:*

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