Designation: F479 – 06 (Reapproved 2022)

# Standard Specification for In-Service Care of Insulating Blankets[1]

This standard is issued under the fixed designation F479; 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 specification covers the in-service care, inspection, testing, and use voltage of insulating blankets for protection of workers from accidental contact with live electrical conductors, apparatus, or circuits. The product requirements and acceptance testing are as shown in Specification D1048.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* See Section 6 and 8.2 for specific precautionary statements.

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]

D1048 Specification for Rubber Insulating Blankets

D2865 Practice for Calibration of Standards and Equipment for Electrical Insulating Materials Testing

F819 Terminology Relating to Electrical Protective Equipment for Workers

2.2 *ANSI Standard:*[3]

C39.5 Safety Requirements for Electrical and Electronic Measuring and Controlling Instrumentation

C84.1 Voltage Ratings for Electric Power Systems and Equipment (60 Hz)

## 3. Terminology

3.1 *Definitions:*

3.1.1 *breakdown*—the electrical discharge or arc occurring between the electrodes and through the equipment being tested.

3.1.2 *compatible*—not injurious to or changing the physical or electrical characteristics of the blankets or affecting their application, use, or acceptability.

3.1.3 *designated person*—an individual who is qualified by experience or training to perform an assigned task.

3.1.4 *electrical testing facility*—a location with qualified personnel, testing equipment, and procedures for the inspection and electrical testing of electrical insulating protective equipment.

3.1.5 *electrode*—the energized or grounded conductor portion of electrical test equipment which is placed near or in contact with the material or equipment being tested.

3.1.6 *flashover*—the electrical discharge or arc occurring between electrodes and over or around, but not through, the equipment being tested.

3.1.7 *insulated*—separated from other conducting surfaces by a dielectric substance (including air space) offering a high resistance to the passage of current.

3.1.7.1 *Discussion*—When any object is said to be insulated, it is understood to be insulated in a suitable manner for the conditions to which it is subjected. Otherwise, it is, within the purposes of this definitions, uninsulated. Insulating covering of conductors is one means of making the conductor insulated.

3.1.8 *ozone*—a very active form of oxygen that may be produced by corona, arcing, or ultraviolet rays.

3.1.9 *ozone cutting and checking*—the cracks produced by ozone in a material under mechanical stress.

3.1.10 *retest*—the tests given after the initial acceptance test usually performed at regular periodic intervals or as required because of physical inspection.

3.1.11 *unassigned blankets*—blankets that are in storage prior to being issued for use.

3.1.12 *voltage, maximum use*—the ac voltage (rms), classification of the protective equipment that designates the maximum nominal design voltage of the energized system that may

[1] This specification is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.25 on Insulating Cover-Up Equipment.

Current edition approved Feb. 1, 2022. Published March 2022. Originally approved in 1976. Last previous edition approved in 2017 as F479– 06 (2017). DOI: 10.1520/F0479-06R22.

[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.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

be safely worked. The nominal design voltage is equal to the phase-to-phase voltage on multiphase circuits.

3.1.12.1 *Discussion*—If there is no multiphase exposure in a system area, and the voltage exposure is limited to the phase (polarity on dc systems) to ground potential, the phase (polarity on dc systems) to ground potential shall be considered to be the nominal design voltage.

3.1.12.2 *Discussion*—If electrical equipment and devices are insulated or isolated, or both, such that the multiphase exposure on a grounded wye circuit is removed, then the nominal design voltage may be considered as the phase-to-ground voltage on that circuit.

3.1.12.3 *Discussion*—The work practices and methods associated with removing multiphase exposures at any given work site are not addressed in the ASTM standards. The users of ASTM standards should reference appropriate industry consensus standards for proper work practices.

3.1.13 *voltage, maximum retest*—the voltage, either ac rms or dc avg, that is equal to the proof test voltage for new protective equipment.

3.1.14 *voltage, nominal design*—a nominal value consistent with ANSI C84.1-2001, assigned to the circuit or system for the purpose of conveniently designating its voltage class.

3.1.15 *voltage, retest*—the voltage, either ac rms or dc avg, that used protective equipment must be capable of withstanding for a specified test period without breakdown.

3.2 For definitions of other terms, refer to Terminology F819.

## 4. Significance and Use

4.1 Compliance with this specification should continue to provide personnel with insulating blankets of known and acceptable quality after initial acceptance in accordance with Specification D1048. The standards herein are to be considered as minimum requirements.

## 5. Classification

5.1 Blankets covered under this specification shall be designated as Type I or Type II; Class 0, Class 1, Class 2, Class 3, or Class 4; Style A or Style B.

5.2 *Type I,* not resistant to ozone, made from a high-grade *cis*-1,4-polyisoprene rubber compound of natural or synthetic origin, properly vulcanized.

5.3 *Type II,* ozone-resistant, made of any elastomer or combination of elastomeric compounds.

5.4 The class designation shall be based on the electrical properties as shown in Specification D1048.

5.5 *Style A,* constructed of the elastomers indicated under Type I or Type II, shall be free of any reinforcement.

5.6 *Style B,* constructed of the elastomers indicated under Type I or Type II, shall incorporate a reinforcement. This reinforcement shall not affect adversely the dielectric characteristics of the blankets.

## 6. Safety Precautions

6.1 A margin of safety shall be provided between the maximum use voltage on which the blankets are used and the voltage at which they are retested. The relationship between retest voltage and maximum use voltage at which the blankets shall be used is shown in Table 1.

6.2 The user of this type of protective equipment shall be knowledgeable of and instructed in the correct and safe visual inspection and use of this equipment.

## 7. Inspection and Testing at an Electrical Testing Facility

7.1 The recommended sequence for inspection and testing of insulating blankets at the electrical testing facility is as follows:

7.1.1 Check in, washing, and preliminary inspection,
7.1.2 Electrical test,
7.1.3 Final inspection,
7.1.4 Recordkeeping and marking, and
7.1.5 Packing for storage and shipping.

7.2 Dirty blankets should be cleaned. They may be washed with a mild soap or mild detergent and water. Mild household-type chlorine bleach may be used for disinfectant purposes. Soaps, detergents, and bleaches shall not be used at strengths that would attack or harm the rubber surface. They shall be rinsed thoroughly with water to remove all of the soap or detergent. Severe dirt and grime may be wiped off using a compatible solvent.

7.2.1 The cleaning agent shall not degrade the insulating or physical qualities of the blankets.

7.2.2 A commercial tumble type washing machine may be used. Caution must be observed to eliminate any interior surfaces or edges that may damage the blankets.

7.3 If washed, blankets should be air-dried. The air temperature should not be over 150°F (65.5°C).

7.4 Prior to the electrical test, the blankets shall be given a preliminary inspection for punctures, cuts, corona cutting, or any obvious condition which would adversely affect the performance. If any of these conditions are found, blankets shall be rejected or repaired.

7.5 The blankets shall be tested in accordance with Section 8.

**TABLE 1 Voltage Requirements for Blankets**

| Class Designation of Blankets | AC Use Voltage, rms, max[A] | AC Retest Voltage, max | DC Retest Voltage, max |
|---|---|---|---|
| 0 | 1000 | 5000 | 20 000 |
| 1 | 7500 | 10 000 | 40 000 |
| 2 | 17 000 | 20 000 | 50 000 |
| 3 | 26 500 | 30 000 | 60 000 |
| 4 | 36 000 | 40 000 | 70 000 |

[A] The maximum use voltage is based on the following equations:
Maximum ac use voltage = 0.95 ac maximum retest voltage – 2 000$_v$
Classes 1, 2, 3, and 4.
Maximum ac use voltage = 0.95 dc maximum retest voltage – 30 500$_v$
Classes 1, 2, 3, and 4.
Maximum ac use voltage = 0.95 dc maximum retest voltage – 18 000$_v$
Class 0.

7.6 After the test, the blankets shall be given an inspection for corona and ozone damage.

## 8. Electrical Tests

8.1 All blankets issued for service shall be retested and shall withstand the 60-Hz ac test voltage (rms value) or the dc voltage (average value) specified in Table 1. The retest shall be performed in accordance with Section 8 and shall be conducted continuously for not less than 1 min, and not more than 3 min.

8.1.1 The interval between date of issue and retests shall be based on work practices and test experience, but shall not exceed 1 year. Blankets that have been tested electrically, but not issued for service, shall not be placed into service unless they have been tested electrically within the previous 12 months.

8.1.2 Where a visual inspection indicates that there may be reason to suspect the electrical integrity of a blanket, an electrical test shall be performed before reissuing the blanket for service.

8.2 The test apparatus shall be designed to afford the operator full protection in the performance of his duties. Reliable means of de-energizing and grounding the high voltage circuit shall be provided. It is particularly important to incorporate positive means of grounding the high voltage section of dc test apparatus due to the likely presence of high-voltage capacitance charges at the conclusion of the test. See ANSI C39.5.

8.2.1 To eliminate damaging ozone and possible flashover along the blanket, there should be a sufficient flow of air into and around the blanket and an exhaust system to adequately remove ozone from the test machine. Consistent ozone cutting and checking during the test procedure should be cause to ascertain the adequacy of the exhaust system.

8.2.2 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 voltages. To ensure the continued accuracy of the test voltage, as indicated by the test equipment voltmeter, the test equipment shall be calibrated at least annually, in accordance with the latest revision of Practice D2865.

8.3 Both ac and dc voltage retest methods are included and either method may be selected for electrical testing.

8.4 All electrical tests shall be performed on clean blankets at normal room temperatures.

NOTE 1—All blankets should be in an unstressed physical condition prior to testing. Failure to achieve this may result in excessive breakdown or damage.

8.5 *AC Test:*

8.5.1 *Voltage Supply and Regulation*—The voltage supply and its control equipment shall be of such size and design that, with the test specimens in the circuit, the crest factor (ratio of peak to mean effective) of the test voltage shall differ by not more than 5 % from that of a sinusoidal wave over the upper half of the range of the test voltage. The accuracy of the voltage measuring circuit shall be within ±2 % of full scale. The correct rms value of the sinusoidal voltage wave form applied to the blanket may be measured by one of the following methods:

8.5.1.1 A voltmeter used in conjunction with a calibrated instrument transformer connected directly across the high voltage circuit,

8.5.1.2 A calibrated electrostatic voltmeter connected directly across the high voltage circuit, or

8.5.1.3 An ac meter connected in series with appropriate high-voltage type resistors directly across the high voltage circuit.

8.5.1.4 The crest factor may be checked by the use of a peak reading voltmeter connected directly across the high-voltage circuit.

8.5.2 *AC Retest:*

8.5.2.1 Each blanket shall be given an electrical retest in accordance with 8.1. The test period shall start at the instant that the prescribed testing voltage is reached.

NOTE 2—It is recommended that the retest voltage be applied initially at a low value and increased at a constant rate-of-rise of approximately 1000 V/s until the prescribed test voltage level is reached. Unless an electrical puncture has already occurred, the applied voltage should be reduced to at least half value at the end of the test period before opening the test circuit.

8.5.2.2 Electrodes shall be of such design so as to apply the electrical stress uniformly over the test area to minimize corona and mechanical strain in the material. The electrodes used in the proof test shall be designed to comply with the flashover clearances specified in Table 2.

NOTE 3—*Recommended Electrodes for Classes 0, 1, and 2*—Rectangular metal sheets approximately 1⁄16 in. (2 mm) thick having edges and corners rounded smoothly and wet pads approximately 1⁄4 in. (6 mm) thick, placed between the metal sheets and the blanket.

*Recommended Electrodes for Classes 3 and 4*—Maximum area can be tested when both electrodes are the same size. When an insulated table is not convenient, the following mask method may be used. A 0.12 in. to 0.18 in. (3 mm to 5 mm) thick sheet of insulating material which is a minimum of 50 in.$^2$ (1270 mm$^2$) and has a 30 in. by 30 in. (762 mm by 762 mm) opening in the center, is placed on a grounded metal plate. This mask which has a "picture frame" appearance shall have the opening filled with a conductive material of such thickness as to bring the ground electrode to approximately the same level as the mask in order to maintain direct contact with the blanket to be tested. The blanket is placed over the ground electrode, and a wet pad approximately the same size as the ground electrode, is placed on top of the blanket. The wet pad is energized with the test voltage. This method will test a 30 in. by 30 in. (762 mm by 762 mm) area of a 36 in. by 36 in. (914 mm by 914 mm) blanket at 40 kV ac as the mask prevents flashover.

*Other electrode designs may be used to achieve the same result.*

8.6 *DC Test:*

8.6.1 *Voltage Supply and Regulation*—The dc test voltage may be obtained from a source capable of supplying a dc voltage whose peak to peak ac ripple component does not

**TABLE 2 Electrode Clearances** [A]

| Class Designation Blanket | AC Retest, in. (mm) | DC Retest, in. (mm) |
|---|---|---|
| 0 | 3 (76) | 3 (76) |
| 1 | 3 (76) | 3 (76) |
| 2 | 5 (127) | 6 (152) |
| 3 | 7 (178) | 8 (203) |
| 4 | 10 (254) | 12 (305) |

[A] These nominal clearances are intended to avoid flashover and may be increased by no more than 2 in. (51 mm) when required by change in atmospheric conditions from the standard of 100 kPa (1 atm) barometric pressure and average humidity conditions. These clearances may be decreased if atmospheric conditions permit.