



Designation: F478 – 14a (Reapproved 2023)

Standard Specification for In-Service Care of Insulating Line Hose and Covers¹

This standard is issued under the fixed designation F478; 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 line hose and covers for protection of workers from accidental contact with energized electrical wires or equipment.

1.2 The following safety hazards caveat applies only to the test method portion, Section 7, of this specification: *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.* Specific precautionary statements are given in 7.2.1.

1.3 *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

- D1049 Specification for Rubber Insulating Covers
- D1050 Specification for Rubber Insulating Line Hose
- 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 Standards:*³

- C 84.1 Voltage Ratings for Electric Power Systems and Equipment (60 Hz)

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 Sept. 1, 2023. Published October 2023. Originally approved in 1976. Last previous edition approved in 2019 as F478 – 14a (2019). DOI: 10.1520/F0478-14AR23.

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>.

C 39.5 Safety Requirements for Electrical and Electronic Measuring and Controlling Instrumentation

2.3 *IEEE Standard:*⁴

IEEE Standard 4 Techniques for High Voltage Testing

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 *bulk storage*—the storage of hose or covers together with one or more layers piled neatly, but without the benefit of spacers, supports, or special protective containers.

3.1.3 *cover*—an electrically insulated enclosure designed to be installed temporarily on various types of irregularly shaped electrical equipment to protect personnel and equipment working in the close proximity.

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

3.1.5 *distorted*—physically changed from the natural and original shape, caused by stress of any type.

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

3.1.7 *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.

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

3.1.9 *hose*—an electrical insulating tube with a longitudinal slit designed to be installed temporarily on energized electrical wires.

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

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

⁴ Available from Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08854-4150.

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

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

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

3.1.15 *voltage, retest*—voltage, either ac rms or dc average, that used protective equipment must be capable of withstanding for a specific 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 line hose and covers of known and acceptable quality after initial acceptance in accordance with Specifications D1050 and D1049. The standards herein are to be considered as minimum requirements.

4.2 A margin of safety shall be provided between the maximum use voltage and their class proof voltage in accordance with Specifications D1050 and D1049, as shown in Table 1.

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

5. Classification

5.1 Line hose covered in this specification are designed as Type I or Type II; Class 0, Class 1, Class 2, Class 3 or Class 4; Style A, Style B, Style C or Style D. Covers covered in this standard are designated as Type I or Type II; Class 0, Class 1, Class 2, Class 3 or Class 4; Style A, Style B, Style C, Style D or Style E.

5.1.1 *Type I*—High-grade *cis*-1,4-polyisoprene rubber compound of natural or synthetic origin, properly vulcanized.

5.1.2 *Type II*—Ozone resistant, made of any elastomer or combination of elastomeric compounds.

5.1.3 The class designations are based on the electrical properties in Specifications D1050 and D1049.

5.1.4 The style designations are based on the designs and descriptions in Specifications D1050 and D1049.

TABLE 1 Voltage Requirements Line Hose and Covers

Class Designation of Hose and Covers	AC Use Voltage, rms, max	DC Max Use Voltage avg, V	AC Retest Voltage, rms	DC Retest Voltage, avg
0	1000	1500	5000	20 000
1	7500	11250	10 000	40 000
2	17 000	25500	20 000	50 000
3	26 500	39750	30 000	60 000
4	36 000	54000	40 000	70 000

6. Washing and Inspection

6.1 The recommended sequence of washing and inspection of contaminated insulating line hose and covers is as follows:

- 6.1.1 Washing,
- 6.1.2 Drying,
- 6.1.3 Inspection,
- 6.1.4 Marking, and
- 6.1.5 Packing for storage and shipment.

6.2 The hose and covers may be washed with a soap, mild non-bleaching detergent, or a cleaner recommended by the equipment manufacturer. After washing, the hose and covers shall be rinsed thoroughly with water.

6.2.1 The cleaning agent shall not degrade the insulating qualities of the line hose and covers.

6.2.2 A commercial tumble-type washing machine may be used, where practicable, but caution must be observed to eliminate any interior surfaces or edges that will cut, abrade, puncture, or pinch the hose or covers.

6.3 The hose and covers shall be air dried. The air temperature shall not be over 150 °F (65.5 °C). They may be suspended to allow drainage and air circulation or dried in a commercial tumble-type automatic dryer. In an automatic dryer, caution must be observed to eliminate any ozone-producing lamps and interior surfaces that will cut, abrade, puncture, or pinch the hose and covers.

6.4 Insulating line hose and covers shall be given a detailed inspection over the entire inner and outer surface for punctures, cuts, severe ozone cutting, or any other obvious condition that would adversely affect performance.

6.5 The hose and covers shall be marked in accordance with Section 12.

7. Electrical Tests

7.1 Where the inspection specified in Section 6 indicates that there may be reason to suspect the electrical integrity of a line hose or cover, an electrical test shall be performed before reissuing the line hose or cover for service.

7.2 Both ac and dc voltage retest methods are included in this section and either or both methods may be selected for electrical test.

7.2.1 **Warning**—In addition to other precautions, it is recommended that the test apparatus be designed to afford the operator full protection in the performance of duties. Reliable means of de-energizing and grounding the high-voltage circuit should 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 C 39.5.

7.2.2 To eliminate damaging ozone and possible flashover along the line hose and cover openings, there should be a sufficient flow of air into and around the line hose or cover 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.