



Designation: D 1050 – 05

## Standard Specification for Rubber Insulating Line Hose<sup>1</sup>

This standard is issued under the fixed designation D 1050; 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 approval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope

1.1 This specification covers acceptance testing of rubber insulating line hose for use as a portable protective device for protection of workers from accidental contact with live electrical conductors.

1.2 Two types of line hose are provided and are designated as Type I, non-resistant to ozone, and Type II and Type III, resistant to ozone.

1.3 Five classes of line hose, differing in electrical characteristics, are provided and are designated as Class 0, Class 1, Class 2, Class 3, and Class 4.

1.4 Four styles of line hose, differing in design characteristics, are provided and are designated as Style A, Style B, Style C, and Style D.

1.5 The following precautionary caveat pertains only to the test method portion, Sections 16, 17, 18, 19, 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 and health practices and determine the applicability of regulatory limitations prior to use.* For specific precautionary statements, see 18.1.1.

### 2. Referenced Documents

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

- D 297 Test Methods for Rubber Products—Chemical Analysis
- D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension
- D 570 Test Method for Water Absorption of Plastics
- D 573 Test Method for Rubber—Deterioration in an Air Oven

D 624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

D 2865 Practice for Calibration of Standards and Equipment for Electrical Insulating Materials Testing

F 819 Terminology Relating to Electrical Protective Equipment for Workers

#### 2.2 Federal Specification:

PPP-B-636 Box, Shipping, Filterboard<sup>3</sup>

#### 2.3 ANSI Standards:<sup>4</sup>

C 2 National Electrical Safety Code, Section 44

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

C 84.1 Electric Power Systems and Equipment-Voltage Ratings

### 3. Terminology

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

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

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

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

3.1.4 *electrode clearance*—the shortest path from the energized electrode to the ground electrode.

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

NOTE 1—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 purpose of this definition, uninsulated. Insulating covering of conductors is one means of making the conductor insulated.

3.1.6 *isolated*—an object that is not readily accessible to persons unless special means of access are used.

<sup>1</sup> 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. This standard replaces ANSI Standard J 6.1, which is no longer available.

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<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.

<sup>3</sup> Available from Standardization Documents, Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, ATTN: NPODS.

<sup>4</sup> Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

3.1.7 *ozone*—a very active form of oxygen that may be produced by corona, arcing, or ultra-violet rays.

3.1.8 *ozone cutting and checking*—the cutting action produced by ozone on rubber under mechanical stress into a series of interlacing cracks.

3.1.9 *rubber*—a generic term that includes elastomers and elastomeric compounds, regardless of origin.

3.1.10 *voltage, maximum use*—the ac voltage (rms) rating of the protective equipment that designates the maximum nominal design voltage of the energized system that may be safely worked. The nominal design voltage is equal to the phase to phase voltage on multiphase circuits.

3.1.11 If there is not multiphase exposure in a system area and the voltage exposure is limited to 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. 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.

NOTE 2—The work practices and methods associated with removing multiphase exposures at any given work site are not addressed in this specification. Users should refer to ANSI C 2, National Safety Code, Section 44, for proper work practices.

3.1.12 *voltage, nominal design*—a nominal value consistent with the latest revision on ANSI C 84.1, assigned to the circuit or system for the purpose of conveniently designating its voltage class.

3.2 For definitions of other terms, refer to Terminology F 819.

#### 4. Significance and Use

4.1 This specification covers the minimum electrical, chemical, and physical properties guaranteed by the manufacturer and the detailed procedures by which such properties are to be determined. The purchaser may at his option perform or have performed any of these tests in order to verify the guarantee. Claims for failure to meet the specification are subject to verification by the manufacturer.

4.2 Line hose is used for personal protection; therefore, when authorizing its use, a margin of safety should be provided

**TABLE 1 Proof-Test/Use Voltage Relationship**

Class of Insulating Line Hose	Nominal Maximum Use Voltage <sup>A</sup> Phase-Phase, ac rms, V	AC Proof-Test Voltage, rms V	DC Proof-Test Voltage, avg, V,
0	1 000	5 000	20 000
1	7 500	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

<sup>A</sup> Except for Class 0 equipment, the maximum use voltage is based on the following formula:

$$\text{Maximum use voltage} = 0.095 \text{ ac proof-test voltage} - 2000$$

The formula takes into account the reduction in the volts per mil capability of the material with increasing thickness.

between the maximum voltage at which it is used and the proof-test voltage at which it is tested. The relationship between proof-test voltage and the nominal maximum voltage at which line hose shall be used is shown in Table 1.

4.3 It is common practice for the user of this type of protective equipment to prepare complete instructions and regulations to govern in detail the correct and safe use of such equipment.

#### 5. Classification

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

5.1.1 *Type I*, non-resistant to ozone, made from a 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 *Type III*, ozone resistant, made of any combination of an elastomer and thermoplastic polymers, elastic in nature.

5.1.4 The class designation shall be based on the electrical properties as shown in Table 1, Table 2, or Table 3.

5.1.5 *Style A* line hose shall be designed in the straight style with a constant cross section throughout the length of the line hose (Fig. 1).

5.1.6 *Style B* line hose shall be designed in the connector-end style, which is similar to the straight style except that it

**TABLE 2 AC Voltage Requirements**

Hose Size, ID, in.	Test Mandrel Size, in. <sup>A</sup>	Types I, II, and III Style A and B			Types II and III Style C and D		
		Class	Proof-Test Voltage, rms V	Minimum Flashover Test Voltage, <sup>B</sup> rms V	Class	Proof-test Voltage, rms V	Minimum Flashover Test Voltage, <sup>B</sup> rms V
1/4	3/16	0	5 000	6 000	0	5 000	7 000
5/8	9/16	1	10 000	12 000	1	10 000	20 000
1	15/16	2	20 000	22 000	2	20 000	30 000
1 1/4	1 3/16	2	20 000	25 000	2	20 000	35 000
1 1/2	1 1/4	3	30 000	30 000	4	40 000	50 000
2	1 3/4	3	30 000	32 000	4	40 000	50 000
2 1/2	2 1/4	3	30 000	35 000	4	40 000	60 000

<sup>A</sup> Commercially available copper, brass, or iron tubing, conduit, or rod that approximates these nominal sizes is acceptable.

<sup>B</sup> The flashover test values investigate design capability of each style of line hose.

**TABLE 3 DC Voltage Requirements**

Hose Size, ID, in.	Test Mandrel Size, in. <sup>A</sup>	Types I, II, and III Style A and B			Types II and III Style C and D		
		Class	Proof-Test Voltage, <sup>B</sup> avg V	Minimum Flashover Test Voltage, <sup>C, D</sup> avg V	Class	Proof-test Voltage, <sup>B</sup> avg V	Minimum Flashover Test Voltage, <sup>C, D</sup> avg V
1/4	3/16	0	10 000	12 000	0	10 000	15 000
5/8	9/16	1	30 000	30 000	1	30 000	55 000
1	15/16	2	35 000	35 000	2	35 000	60 000
1 1/4	1 3/16	2	35 000	45 000	2	35 000	65 000
1 1/2	1 1/4	3	50 000	50 000	4	60 000	75 000
2	1 3/4	3	50 000	60 000	4	60 000	75 000
2 1/2	2 1/4	3	50 000	70 000	4	70 000	90 000

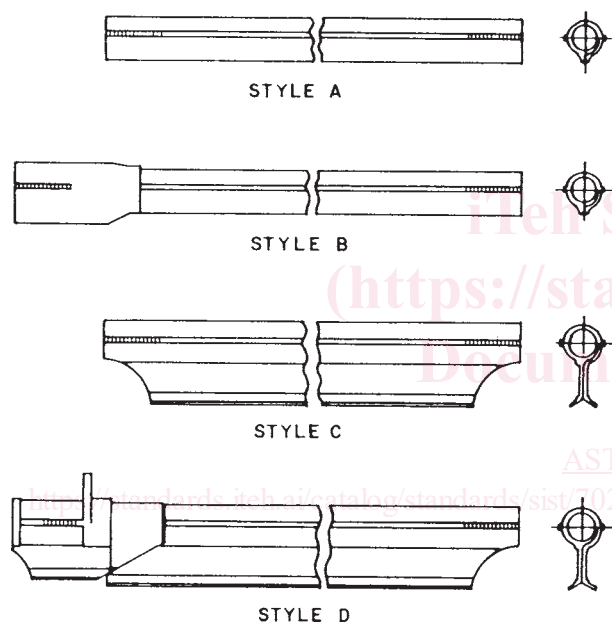
<sup>A</sup> Commercially available copper, brass, or iron tubing, conduit, or rod that approximates these nominal sizes is acceptable.

<sup>B</sup> dc proof-test values shown in Table 3 are limited due to the inability to seal lip openings.

<sup>C</sup> The flashover test values investigate design capability of each style of line hose.

<sup>D</sup> dc flashover values were determined using negative polarity.

**TYPICAL STYLES**



**FIG. 1 Typical Styles**

shall have a molded connector permanently affixed to one end of the line hose (Fig. 1).

5.1.7 *Style C* line hose shall be designed in the extended-lip style with major outward extending lips (Fig. 1).

5.1.8 *Style D* line hose shall be designed in the extended lip style with major outward extending lips. It shall have a molded connector permanently affixed to one end of the line hose (Fig. 1).

NOTE 3—Rubber insulating line hose should remain suitably flexible for application and removal through normal working temperatures of -29 to 54.5°C (-20 to 130°F).

NOTE 4—Separate molded connectors are available to connect two lengths of Style A or Style C line hose.

**6. Ordering Information**

6.1 Orders for line hose under this specification should include the following information:

6.1.1 Type,

6.1.2 Class,  
6.1.3 Style,  
6.1.4 Size, and  
6.1.5 Length.

6.2 The listing of types, classes, styles, sizes, and lengths is not intended to mean that all shall necessarily be available from manufacturers; it signifies only that, if made, they shall conform to the details of this specification. In addition, lengths other than standard lengths may be obtained to meet field conditions.

6.3 Factory-produced openings located on the top, sides, or lips of the hose are permissible. These openings must be specified on the purchase order and shall not be larger than 25 mm (1 in.) in diameter and the center of the opening shall not be more than 25 mm from the end of the hose or less than 25 mm from the edge of the lips.

**7. Manufacture and Marking**

7.1 The line hose shall be constructed in four styles: straight style, connector-end style, extended-lip style, and connector-end extended-lip style. The line hose shall be formed with an interlocking lip of sufficient length to prevent the device from being dislodged accidentally from the conductor it covers. The interlocking lip shall be closely adjacent to the inside surface contour of the outer wall. The adapter end of connector-end style line hose shall be not less than 140 mm (5 1/2 in.) deep, and its inside diameter shall be such that it will snugly grip the end of the line hose of the same size which it joins.

7.2 Each line hose shall be marked clearly and permanently with the name of manufacturer or supplier, type, class, and ASTM D 1050. Line hose may be marked by either molding the information directly into the hose or by use of a label; either method is equally acceptable. The method shall be at the discretion of the manufacturer. If a label is used, the color shall be that specified for each voltage class: Class 0—red, Class 1—white, Class 2—yellow, Class 3—green, and Class 4—orange.

**8. Chemical and Physical Properties**

8.1 Each line hose shall conform to the physical requirements in Table 4 and, for Type I line hose, the determination of rubber polymer in accordance with 19.1.1.