



Designation: **D120—09 D120 – 14**

## Standard Specification for Rubber Insulating Gloves<sup>1</sup>

This standard is issued under the fixed designation D120; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

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

### 1. Scope

- 1.1 This specification covers manufacturing and testing of rubber insulating gloves for protection of workers from electrical shock.
- 1.2 Two types of gloves are provided and are designated as Type I, non-resistant to ozone, and Type II, resistant to ozone.
- 1.3 Six classes of gloves, differing in electrical characteristics, are provided and are designated as Class 00, Class 0, Class 1, Class 2, Class 3, and Class 4.
- 1.4 The values stated in SI units are to be regarded as standard. See [IEEE/ASTM SI 10](#).
- 1.5 The following safety hazards caveat pertains only to the test method portion, Sections 16, 17, 18, and 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 precaution statements, see [18.2](#).

### 2. Referenced Documents

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

- [D297 Test Methods for Rubber Products—Chemical Analysis](#)
- [D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension](#)
- [D573 Test Method for Rubber—Deterioration in an Air Oven](#)
- [D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers](#)
- [D1415 Test Method for Rubber Property—International Hardness](#)
- [D2240 Test Method for Rubber Property—Durometer Hardness](#)
- [D2865 Practice for Calibration of Standards and Equipment for Electrical Insulating Materials Testing](#)
- [F819 Terminology Relating to Electrical Protective Equipment for Workers](#)
- [IEEE/ASTM SI 10 American National Standard for Metric Practice](#)

### 3. Terminology

#### 3.1 Definitions:

- 3.1.1 *color splash*—a splash, smear, or streak of contrasting color evident on the inside or outside surface of the gloves that was deposited during the dipping operation and is vulcanized into the glove as part of the homogenous compound.
- 3.1.2 *glove cuff roll*—the roll or reinforced edge of an insulating glove at the cuff.
- 3.1.3 *halogenation treatment*—exposure of the entire glove surface area to a halogen for the purpose of reducing surface friction.
- 3.1.4 *ozone*—a very active form of oxygen that may be produced by corona, arcing, or ultraviolet rays.
- 3.1.5 *user*—the employer or entity purchasing the equipment to be utilized by workers for their protection; in the absence of such an employer or entity, the individual purchasing and utilizing the protective equipment.

<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 F18.15 on Worker Personal Equipment. This standard replaces ANSI Standard J 6.6, 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.

3.1.6 *working area*—all finger and thumb crotches, the palm (area between the wrist and the base of the finger and thumb) and the area of the finger and thumb facing the palm not extending beyond the center line of the crotch. See Fig. 1.

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

**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 has the option to 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 Gloves are used for personal protection; therefore, when authorizing their use, a margin of safety shall be allowed between the maximum voltage on which they are used and the proof-test voltage at which they are tested. The relationship between proof-test voltage and the maximum voltage at which the gloves shall be used is shown in Table 1.

4.3 Work practices vary from user to user and are dependent upon many factors. These may include, but are not limited to, operating system voltages, construction design, work procedure techniques, weather conditions, and so forth. Therefore, except for the restriction set forth in this specification because of design limitations, the use and maintenance of this equipment is beyond the scope of this specification.

4.4 It is common practice and the responsibility of the user of this type of protective equipment to prepare complete instructions and regulations to govern the correct and safe use of such equipment.

**5. Classification**

5.1 Gloves covered under this specification shall be designated as Type I or Type II; Class 00, Class 0, Class 1, Class 2, Class 3, or Class 4.

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 The class designation shall be based on the electrical properties as shown in Table 2 and Table 3.

**6. Ordering Information**

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

- 6.1.1 Type,
- 6.1.2 Class,

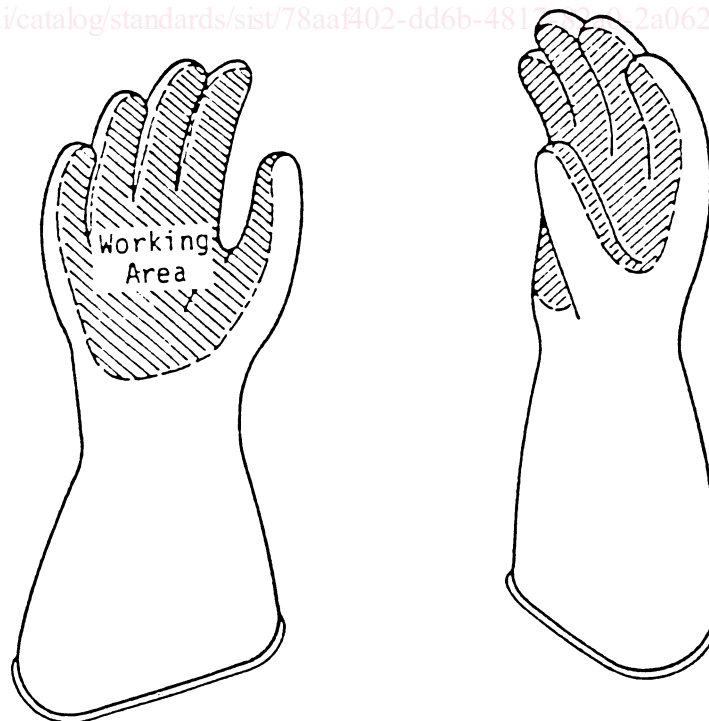


FIG. 1 Working Area of a Rubber Insulating Glove

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

Class of Glove	AC Proof-Test Voltage, rms, V	Maximum AC Use Voltage ac rms, V	DC Proof-Test Voltage, avg, V	Maximum DC Use Voltage avg, V
00	2 500	500	10 000	750
0	5 000	1 000	20 000	1 500
1	10 000	7 500	40 000	11 250
2	20 000	17 000	50 000	25 500
3	30 000	26 500	60 000	39 750
4	40 000	36 000	70 000	54 000

- 6.1.3 Length, [Fig. 2](#)
- 6.1.4 Size,
- 6.1.5 Color,
- 6.1.6 Cuff design, and
- 6.1.7 With or without a halogenation treatment.

6.2 The listing of types, classes, lengths, sizes, colors, and cuff designs 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.

## 7. Manufacture and Marking

7.1 The gloves shall be produced by a seamless process.

7.2 The gloves shall have a smooth finish and the cuff edges shall be finished with a roll or a reinforcing strip of rubber, unless otherwise specified.

7.3 Each glove shall be marked clearly and permanently with the name of the manufacturer or supplier, ASTM D120, type, class, and size. All such marking shall be confined to the cuff portion of the glove and shall be nonconducting and applied in such a manner as to not impair the required properties of the glove.

7.3.1 Each glove shall be marked with a label that gives the information specified in [7.3](#). This label shall be the color specified for each voltage class: Class 00—beige, Class 0—red, Class 1—white, Class 2—yellow, Class 3—green, and Class 4—orange.

7.4 At the request of the user, the gloves may be given a halogenation treatment to reduce surface friction. This treatment shall have no detrimental effect on the electrical, chemical, or physical properties of the gloves.

## 8. Dimensions and Permissible Variations

8.1 Sample gloves selected in accordance with [13.2](#) shall fall within the thickness limits specified in [Table 4](#), when determined in accordance with [17.1](#).

8.2 Sample gloves selected in accordance with [13.2](#) shall conform to standard sizes when determined in accordance with [17.2](#). Standard sizes are 203 mm (8 in.), 216 mm (8½ in.), 229 mm (9 in.), 241 mm (9½ in.), 254 mm (10 in.), 267 mm (10½ in.), 279 mm (11 in.), 292 mm (11½ in.), and 305 mm (12 in.). The permissible variation in size shall be ±13 mm (±½ in.).

8.3 Sample gloves selected in accordance with [13.2](#) shall conform to standard lengths when measured in accordance with [17.3](#).

8.3.1 Standard lengths for Class 00 gloves are 280 mm (11 in.), and 360 mm (14 in.). The permissible variations shall be ±13 mm (±½ in.).

8.3.2 Standard lengths for Class 0 gloves are 280 mm (11 in.), 360 mm (14 in.), 410 mm (16 in.), and 460 mm (18 in.). The permissible variations shall be ±13 mm (±½ in.).

8.3.3 Standard lengths for Class 1, 2, and 3 gloves are 360 mm (14 in.), 410 mm (16 in.), and 460 mm (18 in.). The permissible variation shall be ±13 mm (±½ in.).

8.3.4 Standard lengths for Class 4 gloves are 410 mm (16 in.) and 460 mm (18 in.). The permissible variation shall be ±13 mm (±½ in.).

## 9. Workmanship and Finish

9.1 Gloves shall be free on both inner and outer surface of harmful physical irregularities that can be detected by thorough test and inspection.

9.1.1 Harmful physical irregularities may be defined as any feature that disrupts the uniform, smooth surface contour and represents a potential hazard to the user, such as pinholes, cracks, blisters, cuts, conductive embedded foreign matter, creases, pinch marks, voids (entrapped air), prominent ripples, and prominent mold marks.

9.2 Nonharmful physical irregularities may be defined as surface irregularities present on the inner and outer surfaces of the rubber glove due to imperfections on forms or molds and inherent difficulties in the manufacturing process. These irregularities may appear as mold marks that look like cuts even though they are actually a raised ridge of rubber, indentations, protuberances, embedded foreign material, or color splashes that are acceptable provided that:

**TABLE 2 AC Voltage Requirement Proof Test Currents<sup>A</sup>**

Class of Glove	Proof-Test Voltage, rms, V	Minimum Breakdown Voltage, rms, V	Maximum Proof-Test Current, mA							
			280-mm (11-in.) Glove		360-mm (14-in.) Glove		410-mm (16-in.) Glove		460-mm (18-in.) Glove	
			50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
00	2 500	4 000	6.7	8	10	12	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>
0	5 000	6 000	6.7	8	10	12	11.7	14	13.3	16
1	10 000	20 000	...	...	11.7	14	13.3	16	15	18
2	20 000	30 000	...	...	13.3	16	15	18	16.7	20
3	30 000	40 000	...	...	15	18	16.7	20	18.3	22
4	40 000	50 000	...	...	...	...	18.3	22	20	24

<sup>A</sup> Proof test current shall be measured to an accuracy of  $\pm 1$  mA.

<sup>B</sup> Not applicable.

**TABLE 3 DC Voltage Requirements**

Class of Glove	Proof-Test Voltage avg V	Minimum Breakdown Voltage avg V
00	10 000	13 000
0	20 000	35 000
1	40 000	60 000
2	50 000	70 000
3	60 000	80 000
4	70 000	90 000

9.2.1 The indentations, protuberance or mold marks tend to blend into a smooth slope upon stretching of the material.

9.2.2 The rubber thickness at any irregularity conforms to the thickness requirements.

9.2.3 Foreign material remains in place when the glove is folded and stretched with the material surrounding it.

9.2.4 Color splashes are no larger than 1 mm in any direction on the inner surface of the work area.

9.2.4.1 The working area is defined as all finger and thumb crotches, the palm (area between the wrist and the base of the finger and thumb) and the area of the finger and thumb facing the palm not extending beyond the center line of the crotch. See Fig. 1.

## 10. Chemical and Physical Requirements

10.1 Glove test material taken from sample gloves selected in accordance with 13.3 shall conform to physical requirements in Table 5 and the accelerated aging in 19.2.6.

10.2 In the event of a dispute, the identification of the rubber polymer in Type I gloves shall be performed in accordance with 19.1. <https://standards.iteh.ai/catalog/standards/sist/78aa402-dd6b-4817-82a0-2a062a3e2bdf/astm-d120-14>

10.3 Type II glove test material taken from sample gloves selected in accordance with 13.3 shall show no visible effects of ozone when tested in accordance with 18.6. Any visible signs of ozone deterioration of the glove material, such as checking, cracking, breaks, pitting, and so forth, shall be considered as evidence of failure to meet the requirements of Type II gloves.

## 11. Electrical Requirements

11.1 Each glove shall be given a proof test and shall withstand the 50-Hz or 60-Hz AC proof-test voltage (rms value) or the dc proof-test voltage (average value) specified in Table 2 or Table 3. The proof test shall be performed in accordance with Section 18. The test voltage shall be applied continuously for 3 min.

11.1.1 When the ac proof test is used, the 60-Hz proof-test current shall not exceed the values specified in Table 2 at any time during the test period. (Note 1).

11.2 Sample gloves selected in accordance with 13.2 shall not break down at voltages below those specified in Table 2 or Table 3 when tested in accordance with Section 18.

11.2.1 Gloves that have been subjected to a minimum breakdown voltage test shall not be used for electric protection. Proof test current shall be measured to an accuracy of  $\pm 1$  mA.

11.3 Sample gloves selected in accordance with 13.2 shall be subjected to a 50-Hz or 60-Hz AC moisture absorption/proof test in accordance with Section 18.

11.3.1 The 50-Hz or 60-Hz AC proof test current shall not exceed the values specified in Table 2 by more than 2 mA.

NOTE 1—A proof-test current is an indication of the validity of the glove make-up, the dielectric constant of the type of material used, the thickness, and the total contact area under test.

## 12. Guarantee

12.1 The manufacturer or supplier shall replace, without charge to the purchaser, unused gloves which, at any time within a period of nine (9) months from date of initial delivery of shipment to the purchaser or his designee, fail to pass the tests in this

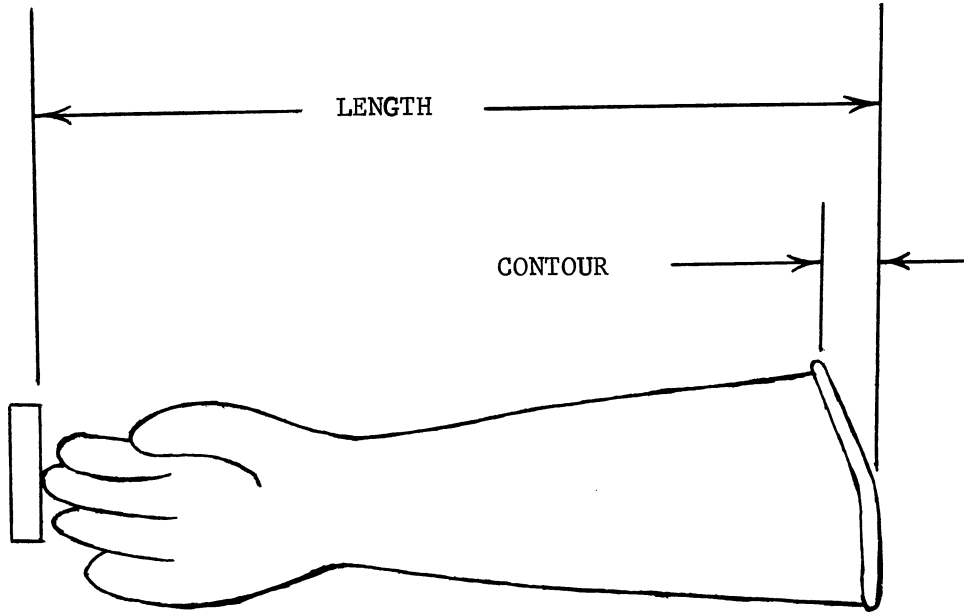


FIG. 2 Length and Contour Measurements on Contour Cuff Gloves

TABLE 4 Thickness Measurements

Class of Glove	Minimum Thickness				Maximum Thickness	
	In Crotch		Other Than Crotch		mm	in.
	mm	in.	mm	in.		
00	0.20	0.008	0.25	0.010	0.75	0.030
0	0.46	0.018	0.51	0.020	1.02	0.040
1	0.63	0.025	0.76	0.030	1.52	0.060
2	1.02	0.040	1.27	0.050	2.29	0.090
3	1.52	0.060	1.90	0.075	2.92	0.115
4	2.03	0.080	2.54	0.100	3.56	0.140

TABLE 5 Physical Requirements

Property	Type I	Type II
Tensile strength, min, Die C, MPa (psi)	17.2 (2500)	10.3 (1500)
Tensile stress at 200 %, max, MPa (psi)	2.1 (300)	2.1 (300)
Ultimate elongation, min, %	600	500
Tension set, max at 400, %	25	25
Tear resistance, min, kN/m (lbf/in.)	21 (120)	14 (80)
Puncture resistance, min, kN/m (lbf/in.)	18 (100)	18 (100)
Hardness, max, shore A	47	47

specification. This guarantee will be binding on the manufacturer or supplier only if the gloves have been properly stored and have not been subjected to more than an original acceptance test and one retest.

12.2 Any acceptance test made by the purchaser, or the purchaser’s designee, shall be performed within the first two (2) months of the guarantee period unless otherwise specified.

NOTE 2—Proper storage means that gloves are stored right side out, not distorted and not stored directly above or in proximity to steam pipes, radiators, or other sources of artificial heat, or exposed to direct sunlight or other sources of ozone. It is desirable that the ambient storage temperature shall not exceed 35 °C (95 °F).

### 13. Sampling

13.1 Each glove in a lot or shipment shall be subjected to inspection and test to meet the requirements of Sections 7, 11.1, 9, and 15.

13.2 An original sample of 1 % of the lot or shipment or not less than two gloves, whichever is greater, shall be selected at random from the lot or shipment for the test requirements of 11.2, 11.3 and Section 8. Where a failure occurs in the first sample, a second sample of the same quantity shall be selected and tested.

13.3 An original sample of 0.1 % of the lot or shipment or not less than two gloves, whichever is greater, shall be selected at random from the lot or shipment for the test requirements of Sections 10.1 and 10.3.

#### 14. Rejection

14.1 Individual gloves shall be rejected if they fail to meet the requirements of Sections 7, 9 and 11.1 and the minimum thickness requirements of 8.1.

14.2 Individual gloves may be rejected at the option of the purchaser if they fail to meet the requirements of Sections 8 and 15.

14.3 The entire lot or shipment of gloves shall be rejected under any of the following conditions:

14.3.1 If 5 % or more, but not less than two gloves, in a lot or shipment fail to meet the requirements of 11.1.

14.3.2 If two gloves in the first sample fail to meet the requirements of 11.2.

14.3.3 If one glove in the original sample and one or more gloves in the second sample fail to meet the requirements of 11.2.

14.3.4 If the sample of Type II gloves, using the sampling methods of 13.3, fails to meet the requirements of 10.3.

14.3.5 If the proof test current on two gloves in the first sample do not meet the requirements of 11.3.

14.3.6 If the proof test current on one glove in the original sample and the proof test current on one or more gloves in the second sample fail to meet the requirements of 11.3.

14.4 The testing shall be terminated and the manufacturer or supplier notified if, during the course of testing, the gloves in a lot or shipment fail to meet the requirements of 10.3, 11.1, 11.2, or 11.3 as determined by the rejection criteria of 14.3.1, 14.3.2, 14.3.3, 14.3.4, 14.3.5, or 14.3.6. The manufacturer or supplier may in such a case require the purchaser to submit proof that the test procedure and equipment conform to the appropriate paragraphs of Section 18. When such proof has been furnished, the manufacturer or supplier may request that his representative witness the testing of additional gloves from the shipment.

14.5 The entire lot or shipment may be rejected at the option of the purchaser if two specimens of the first sample and one of the second sample, selected in accordance with 13.3, fail any of the separate requirements outlined in Section 10.

14.6 The entire lot or shipment of gloves may be rejected at the option of the purchaser if 25 % of the gloves in the lot or shipment fail to meet the requirements of Section 8 or 9.

14.7 All rejected material shall be returned as directed by the manufacturer, at his or the supplier's request, without being defaced by rubber stamp or other permanent marking. However, those gloves punctured when tested in accordance with 11.1, 11.2, and 11.3 shall be stamped, punched, or cut prior to being returned to the supplier to indicate that they are unfit for electrical use.

#### 15. Packaging and Package Marking

15.1 Each pair of gloves shall be packaged in an individual container of sufficient strength to properly protect the gloves from damage in transit. The end of the container shall be marked with the name of the manufacturer or supplier, type, class, length, size, color, and cuff design.

### TEST METHODS

#### 16. Sequence of Testing

16.1 The following order of procedure is suggested for testing rubber insulating gloves:

16.1.1 Inspection of the surfaces in accordance with Section 9.

16.1.2 The dimensions in accordance with Section 17.

16.1.3 Electrical proof tests in accordance with 18.4.2 or 18.5.2.

16.1.4 AC moisture absorption/proof test in accordance with 18.4.4.

16.1.5 Breakdown voltage tests in accordance with 18.4.3 or 18.5.3.

16.1.6 Ozone resistance tests in accordance with 18.6.

16.1.7 Chemical and physical property tests in accordance with Section 19.

#### 17. Dimension Measurements

17.1 *Thickness:*

17.1.1 Thickness measurements shall be made at four or more points on the palm side, four or more points on the back side, one or more points in the crotch of the thumb and index finger, and one or more points in the crotches between the fingers. See Table 4.

17.1.2 Thickness measurements shall be made on complete gloves with a micrometer graduated to within 0.025 mm (0.001 in.), having an anvil about 6 mm (0.25 in.) in diameter and a presser foot of  $3.17 \pm 0.25$  mm ( $0.125 \pm 0.010$  in.) in diameter. The presser foot shall exert a total force of  $0.83 \pm 0.03$  N ( $3.0 \pm 0.1$  ozf).

NOTE 3—A dial-type micrometer graduated in millimetres or inches and mounted in a manner similar to that shown in Fig. 3 and Fig. 4 is particularly convenient for making these measurements.