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Standard Specification for Rubber Insulating Gloves[1]

This standard is issued under the fixed designation D 120; 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.

This standard has been approved for use by agencies of the 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 the standard. See 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:* [2]

D 297 Test Methods for Rubber Products—Chemical Analysis

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D 518 Test Method for Rubber Deterioration—Surface Cracking

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 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber

D 1415 Test Method for Rubber Property—International Hardness

D 2240 Test Method for Rubber Property—Durometer Hardness

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

F 819 Terminology Relating to Electrical Protective Equipment for Workers

SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System

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.

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 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 has the option to perform or

[1] This specification is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.15 on Worker Personal Equipment. This standard replaces ANSI Standard J 6.6, which is no longer available.

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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.

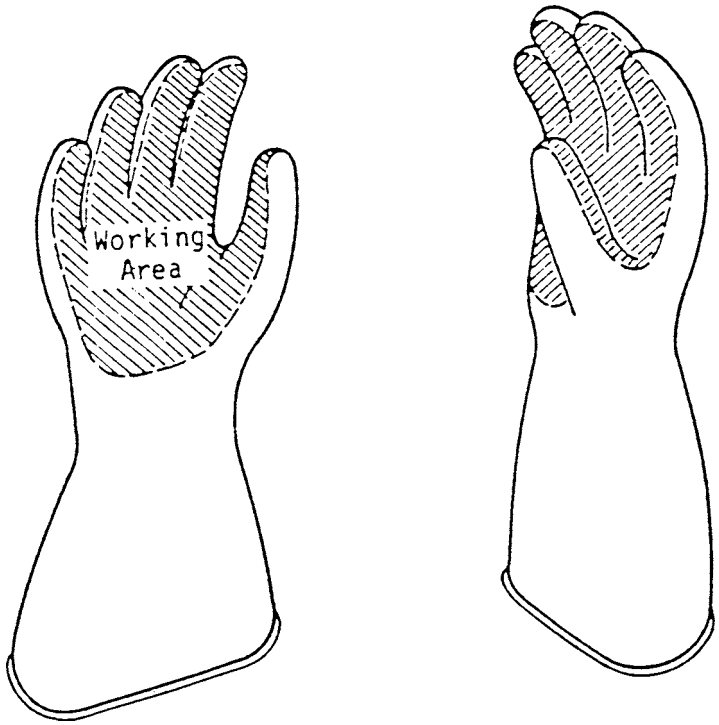

FIG. 1 Working Area of a Rubber Insulating Glove

TABLE 1 Proof-Test/Use Voltage Relationship

Class of Glove	AC Proof-Test Voltage, rms, V	Maximum AC Use Voltage[A] 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

[A] Except for Class 00 and 0 gloves, the AC_{RMS} maximum use voltage is based on the following formula:

Maximum AC use voltage (maximum nominal design voltage) = 0.95 ac proof-test voltage – 2000 V

This formula takes into account the reduction in the volts per mil capability of the glove with increasing thickness of the rubber.

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,
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.

TABLE 2 AC Voltage Requirement Proof Test Currents[A]

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
00	2 500	4 000	8	12	[B]	[B]
0	5 000	6 000	8	12	14	16
1	10 000	20 000	...	14	16	18
2	20 000	30 000	...	16	18	20
3	30 000	40 000	...	18	20	22
4	40 000	50 000	...	...	22	24

[A] Proof test current shall be measured to an accuracy of ±1 mA.
[B] 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

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, ANSI/ASTM D 120, 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:

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.

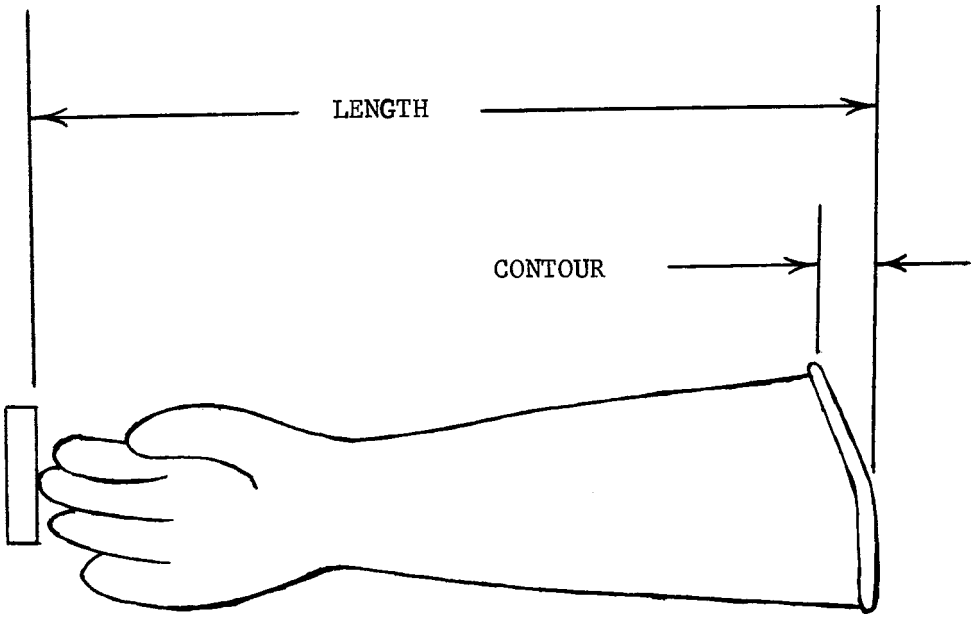

FIG. 2 Length and Contour Measurements on Contour Cuff Gloves

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

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.

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. In case of dispute, Method A of the ozone resistance test shall be the referee test.

11. Electrical Requirements

11.1 Each glove shall be given a proof test and shall withstand the 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 and Note 2).

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 ±1 mA.

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

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

NOTE 1—If the ac proof test is made at any frequency other than 60 Hz, the permissible proof-test current shall be computed from the direct ratio of the frequencies.

NOTE 2—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 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.