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Standard Specification for Electrically Insulating Plastic Guard Equipment for Protection of Workers[1]

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ε[1] NOTE—A precision and bias statement was added in May 2004.

1. Scope

1.1 This specification covers plastic guard equipment and guard systems used by workers for temporary insulation on electric power circuits.

1.2 Plastic guard equipment covered by this specification is rated for momentary, or brush contact only. Maximum-use voltages are covered in Annex A1.

1.3 Typical guards covered include, but are not limited to, the following:

1.3.1 Conductor guards and connecting covers as follows:

1.3.1.1 Line guards,

1.3.1.2 Line guard connectors,

1.3.1.3 Insulator covers,

1.3.1.4 Dead end covers,

1.3.1.5 Bus guards, and

1.3.1.6 Bus "T" guards.

1.3.2 Structure and apparatus covers as follows:

1.3.2.1 Pole guards,

1.3.2.2 Ridge pin covers,

1.3.2.3 Switch-blade covers,

1.3.2.4 Arm guards,

1.3.2.5 Cutout covers, and

1.3.2.6 Cross arm guard.

1.4 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

D 149 Test Methods for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies [2]

D 150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials [2]

D 256 Test Methods for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics [3]

D 570 Test Method for Water Absorption of Plastics [3]

F 712 Test Methods for Electrically Insulating Plastic Guard Equipment for Protection of Workers [4]

2.2 *IEEE Standard:*

978 Guide for In-Service Maintenance and Electrical Testing for Live-Line Tools [5]

2.3 *UL Standard:*

94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances [6]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *insulating plastic guards*—devices for temporary installation on structures or energized electric power circuits for electrical protection of personnel or equipment, or both.

3.1.2 *self extinguishing*—relates to a property of a plastic material compounded so as to cease combustion on removal of the source that caused ignition.

4. Significance and Use

4.1 This specification covers the minimum electrical, chemical, and physical properties designated 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 and may reject equipment that fails to meet the standard criteria. Claims concerning failure to meet the specification are subject to verification by the manufacturer.

4.2 Plastic guard equipment is used for protection against accidental brush contact by the worker. A margin of safety shall be provided between the maximum voltage at which they are used and the proof-test voltage at which they are tested. This

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[2] *Annual Book of ASTM Standards*, Vol 10.01.

[3] *Annual Book of ASTM Standards*, Vol 08.01.

[4] *Annual Book of ASTM Standards*, Vol 10.03.

[5] Available from the Institute of Electrical and Electronics Engineers, 345 E. 47th St., New York, NY 10017.

[6] Available from Underwriters Laboratories, 333 Pfingsten Rd., Northbrook, IL 60062.

relationship is shown in Table A1.1. The equipment is designed only for phase-to-ground or coveredphase-to-covered-phase exposure.

NOTE 1—Rubber insulating equipment is realistically limited to Class 4 material in the design specification standards. Plastic guard equipment has been designed to go beyond these voltages and provide a satisfactory degree of worker protection. Major differences exist in use criteria between the rubber and the plastic guard equipment. Each glove, sleeve, or other article of rubber insulating equipment has a given safety factor for the phase to phase voltage on which it may be used and the class or proof voltage at which it is tested. Plastic guard equipment, however, is designed to provide a satisfactory safety factor only when used in a phase-to-ground exposure. If exposure is phase-to-phase, then a satisfactory safety factor is only provided if the exposure is covered-phase-to-covered-phase.

4.3 Work practices vary from user to user, dependent upon many factors. These may include, but are not limited to, operating system voltages, construction design, work procedure techniques, weather conditions, etc. Therefore, except for the restrictions 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 in detail the correct and safe use of such equipment.

5. Classification

5.1 Guards are furnished in three types of materials specified in Section 6 and explained as follows:

5.1.1 Type I guards are constructed of plastic material having mechanical impact properties suitable for cold weather service.

5.1.2 Type II guards have self-extinguishing plastic construction.

5.1.3 Type III guards are constructed of self-extinguishing plastic material having mechanical impact properties suitable for cold weather service.

5.2 Guards are furnished in three grades in accordance with provisions for installation as follows:

5.2.1 Grade 1 guards have hot stick handles attached for installation.

5.2.2 Grade 2 guards are equipped with eyes for installation with removable hot sticks.

5.2.3 Grade 3 guards are intended for applications where the usual installation is by hand. These guards are equipped with rope loops, or their equivalent, so their removal may be accomplished with hot sticks.

5.2.3.1 *Example*—Pole guards installed on a pole prior to raising it close to overhead line conductors. After the pole is raised the guard is opened with hot sticks and allowed to slide down the pole where it can be safely removed by hand.

5.3 Guards are made in five classes in accordance with the voltage ratings in Annex A1.

6. Ordering Information

6.1 Orders for guards under this specification shall include the designation ASTM Specification F 968 and should include the following information.

6.1.1 Quantity,

6.1.2 Name-description of guard or cover,

6.1.3 Type, see 4.1,

6.1.4 Grade, see 4.2,

6.1.5 Class, see 4.3, and

6.1.6 Size, if applicable, see Section 8.

NOTE 2—A typical ordering description is as follows: 100 Line Guards, ASTM Specification F 968, Type I, Grade 1, Class 3A, 4.5-ft long.

NOTE 3—It is expected that manufacturers will publish catalog data conforming to this specification that will combine the requirements of 6.1.2-6.1.6 in a single product number. With that system, a typical order description is: 100 (Smith Manufacturing Co., Product No. XXXX) Line Guards, ASTM Specification F 968.

7. Materials

7.1 Principal construction of insulating body shells shall be in accordance with the material requirements as follows:

7.1.1 *Type I Guards*—Minimum 1.5 ft·lbf/in. (80.06 J/m of notch) notched izod impact strength at − 20°F(−29°C); maximum water absorption 0.1 % by weight; minimum 380 V/mL (0.025 mm) dielectric strength.

7.1.2 *Type II Guards*—Minimum 1.0 ft·lbf/in. (53.4 J/m) notched izod impact strength at − 20°F(−29°C); maximum water absorption 0.5 % by weight; minimum 320 V/mL (0.025 mm) dielectric strength; 94 V-O flame retardancy.

7.1.3 *Type III Guards*—Minimum 3.0 ft·lbf/in. (160.1 J/m of notch) notched izod impact strength at − 20°F(−29°C); maximum water absorption 0.09 % by weight; minimum 300 V/mL (0.025 mm) dielectric strength; 94 V-O flame retardancy.

7.1.4 Material ratings for Notched Izod Impact Strength shall be in accordance with Test Methods D 256, Method A.

7.1.5 Material ratings for water absorption shall be in accordance with Test Method D 570.

7.1.6 Material ratings for dielectric strength shall be in accordance with Test Method D 149.

7.1.7 Material ratings for flame retardancy shall be in accordance with UL Standard 94.

7.2 Handles of Grade 1 Guards shall be reinforced plastic and shall be capable of withstanding 100 kV at 60 Hz for each 1 ft (300 mm) of length for 5 min without heating or tracking. (See 5.6.2 of IEEE Standard 978.)

7.3 Ropes and cords shall be nonconductive.

8. Electrical Requirements

8.1 Electrical properties shall meet the requirements shown in Annex A1.

9. Dimensions

9.1 Some, but not all, guards are made in specific sizes in accordance with the requirements of their applications.

9.1.1 *Example*—Pole guards made in lengths 1 ft through 6 ft (300 mm through 1.8 m) and for poles 6, 9, or 12-in. diameter (150, 225 or 300 mm, respectively).

10. Workmanship, Finish, and Appearance

10.1 Guards shall be free of splits, punctures, gouges, or other structural defects that might affect insulating properties.

10.2 Minor surface imperfections that do not affect insulation properties required by Annex A1 are not cause for rejection.

11. Sampling and Testing

11.1 Sampling and testing shall be done in accordance with Test Methods F 712.

11.2 Design tests of each product model shall be conducted to verify that the requirements of Annex A1 are met.

12. Inspection

12.1 Inspection shall include:

12.1.1 Size specified on order, if applicable,

12.1.2 Workmanship as indicated in Section 10, and

12.1.3 Markings in accordance with Section 15.

13. Acceptance, Rejection, and Rehearing

13.1 Inspection shall be in accordance with Section 12. Individual guards that do not conform may be rejected.

13.2 Testing may be required by a user prior to acceptance or being placed in service. When required, the Withstand Voltage Proof Test, in accordance with Table A1.1, may be used on all or part of a lot of guards.

13.3 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

14. Certification

14.1 When specified in purchase order or contract, a producer's or supplier's certification shall be furnished to the purchaser stating that the guards were manufactured, sampled, tested, and inspected in accordance with this specification and have been found to meet its requirements. When specified in the purchase order or contract, a report of design tests shall be furnished. (See Test Methods F 712.)

15. Marking

15.1 Guards shall be marked with the name or logo of the manufacturer, identity number, and lot code to indicate month and year of manufacture, for example, "__ kV Guarded Phase to Guarded Phase" and "__ kV Phase to Ground."

15.2 A packing list shall be provided with each shipment indicating manufacturer's product numbers and quantities of each different guard.

16. Packaging

16.1 Each shipment shall be packaged to provide protection of contents normally appropriate for selected mode of transportation.

17. Precision and Bias

17.1 No statement is made about either the precision or the bias of the test methods in this standard for measuring the dielectric strength since the results merely state whether there is conformance to the criteria for success specified in the procedure.

18. Keywords

18.1 electrical protective equipment; electrically insulating plastic guard equipment; plastic guard equipment

SUPPLEMENTARY REQUIREMENTS

INTRODUCTION

One or more of the following supplementary requirements shall be applied only when specified by the purchaser in the inquiry, contract, or order. Details of these supplementary requirements shall be agreed upon in writing between the producer or supplier and purchaser. Supplementary requirements shall in no way negate any requirement of the specification itself.

S1. Special Physical Shape, Size Configuration, or Attachments

S2. Special Electrical Requirement More Stringent Than Required by This Specification

S3. Special Markings

S4. Special Packaging

ANNEX

(Mandatory Information)

A1. PROOF TEST WITHSTAND VOLTAGE AND FLASHOVER VOLTAGE TESTS FOR PLASTIC GUARDS

TABLE A1.1 Withstand Voltage Proof Test[A,B]

Class	Rating, kV	Max Use 60 Hz	Proof Test Withstand Voltage (In-Service Testing)			Criteria
	[B]0-0	0-Ground	0-Ground kV		Duration, min	
			60 Hz	DC		
2	14.6	8.4	13.0	18	1	No flashover other than momentary as a result of too-close spacing of electrode.
3	26.4	15.3	24.0	34	1	
4	36.6	21.1	32.0	45	1	
5	48.3	27.0	42.0	60	0.5	
6	72.5	41.8	64.0	91	0.25	

[A] Refer to Method A of Test Methods F 712.
[B] Cover-up materials are tested at values greater than the maximum use phase to ground values. The maximum use phase to phase values relate to guarded phase to guarded phase. The units are not rated for bare phase to guarded phase potentials.

TABLE A1.2 Minimum Flashover Test[A,B]

Class	Rating, kV	Max Use 60 Hz	Min Flashover Test 0-Ground kV		Criteria
	[B]0-0	0- Ground	60 Hz	DC	
2	14.6	8.4	14.0	20	No flashover other than momentary as a result of too-close spacing of electrode.
3	26.4	15.3	25.0	35	
4	36.6	21.1	34.0	48	
5	48.3	27.0	43.0	61	
6	72.5	41.8	67.0	95	

[A] Refer to Method B of Test Methods F 712.
[B] Cover-up materials are tested at values greater than the maximum use phase to ground values. The maximum use phase to phase values relate to guarded phase to guarded phase. The units are not rated for bare phase to guarded phase potentials.