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Standard Specification for PVC Insulating Sheeting¹

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1. Scope

1.1 This specification covers acceptance testing of Poly Vinyl Chloride insulating sheeting for use as a covering for protection of workers.

1.2 The following safety hazards caveat applies only to the test method portion, Sections 17-19, 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.* See 18.1 for a specific warning statement.

2. Referenced Documents

2.1 ASTM Standards:²

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D570 Test Method for Water Absorption of Plastics

D747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam

D1004 Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting

D1048 Specification for Rubber Insulating Blankets

D1746 Test Method for Transparency of Plastic Sheeting

D2240 Test Method for Rubber Property—Durometer Hardness

2.2 American National Standard:³

ANSI C84.1 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.

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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.

³ Available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

3. Terminology

3.1 Definitions:

3.1.1 *voltage, maximum use*—the ac voltage (rms) classification 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 phase-to-phase voltage on multiphase circuits.

3.1.1.1 *Discussion*—If there is no 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.

3.1.1.2 *Discussion*—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.

3.1.2 *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.

4. Significance and Use

4.1 This specification covers the minimum electrical 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.

NOTE 1—This material is intended for a single use application.

4.2 The safe and proper field use of PVC sheeting is beyond the scope of this specification.

4.2.1 When authorizing use of PVC sheeting for personal protection, a margin of safety should be allowed between the maximum voltage at which it is used and the proof-test voltage at which it is tested. The relationship between proof-test and the maximum voltage at which sheeting shall be used is shown in Table 1.

5. Classification

5.1 PVC insulating sheeting covered under this specification shall be designated as Class 0 or Class 1.

TABLE 1 Proof Test/Use Voltage Relationship

NOTE 1—The ac voltage (rms) classification of the protective equipment designates the maximum nominal design voltage of the energized system that may be safely worked. The nominal design voltage is equal to:
 (a) The phase to phase on multiphase circuits, or
 (b) The phase to ground voltage on single phase grounded circuits.

Class of Insulating Sheeting	Maximum Use Voltage ^A Phase-Phase ac rms, max	AC Proof-Test Voltage, rms V	DC Proof-Test Voltage, avg V
0	1000	5000	8500
1	7500	10 000	17 000

^AExcept for class 0 equipment, the maximum AC use voltage is based on the following formula: Maximum use voltage (maximum nominal design voltage) = 0.95 ac proof-test voltage-2000.

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

6. Ordering Information

6.1 Orders for PVC insulating sheeting under this specification should include the following information:

- 6.1.1 Class,
- 6.1.2 Thickness,
- 6.1.3 Width, and
- 6.1.4 Length.

7. Manufacture and Marking

7.1 The insulating sheet shall consist of a clear PVC compound with a smooth, polished finish on each surface (see **Fig. 1**).

7.2 Each piece of sheeting shall be marked clearly and permanently at a maximum interval of 1 m (3 ft) with the name of the manufacture or supplier, ASTM D and class.

8. Physical Requirements

8.1 Insulating sheeting shall conform to the physical requirements in **Table 4**.

8.2 PVC insulating sheeting should remain flexible for use through normal temperature ranges.

8.3 PVC insulating sheeting is clear but may be tinted to aid in visual identification.

9. Electrical Requirements

9.1 The entire length of each roll of sheeting when new (unused) shall withstand the 60-Hz ac proof-test voltage (rms value) specified in **Table 2** or the dc proof-test voltage (avg

TABLE 2 AC Voltage Requirements

Class	Electrode Clearances Min ^A		Proof Test Voltage rms V	Dielectric Breakdown Test Voltage rms V
	mm	in.		
0	76	3	5000	10 000
1	76	3	10 000	20 000

^AThese nominal clearances are intended to avoid flashover and may be increased from the standard of 100 kPa (1 atm) barometric pressure and average humidity by no more than 51 mm (2 in.) when required by change in atmospheric conditions. These clearances may be decreased if atmospheric conditions permit.

TABLE 3 DC Voltage Requirements

Class	Electrode Clearances Min ^A		Proof Test Voltage avg V	Dielectric Breakdown Test Voltage avg V
	mm	in.		
0	76	3	8500	17 000
1	76	3	17 000	44 000

^AThese nominal clearances are intended to avoid flashover and may be increased from the standard of 100 kPa (1 atm) barometric pressure and average humidity by no more than 51 mm (2 in.) when required by change in atmospheric conditions. These clearances may be decreased if atmospheric conditions permit.

value) specified in **Table 3**. The test voltage shall be applied continuously for 1 min.

9.2 The sheeting material when tested between 51-mm (2-in.) disk electrodes with edges rounded to a radius of 6 mm (0.25 in.), shall show a 60-Hz dielectric strength of not less than the requirements shown in **Table 2** or **Table 3** for the thickness of each individual specimen.

10. Dimensions and Permissible Variations

10.1 *Width*—Standard widths shall be 1220 ± 25 mm (48 ± 1 in.). Other widths may be negotiated with the manufacturer.

10.2 *Thickness*—The thickness of the sheeting shall be as specified in **Table 5**.

11. Workmanship and Finish

11.1 The sheeting shall be smooth and uniform and free of harmful physical irregularities, which can be detected by a thorough test or inspection.

11.1.1 *Nonharmful Irregularities*—Flow marks may be present on all PVC sheeting due to inherent difficulties in the manufacturing process. These irregularities may appear as waves in the sheeting which are acceptable provided that the sheeting thickness at any irregularity conforms to the thickness requirements of **Table 5**.

12. Guarantee

12.1 The manufacturer or supplier shall replace, without charge to the purchaser, unused sheeting which at any time within a period of nine 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 sheeting has been properly stored and has 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 months of the guarantee period unless otherwise specified.

NOTE 2—Proper storage means that the sheeting is stored without distortion and not stored directly above or in proximity to steam pipes, radiators, or other sources of artificial heat, or exposed to direct sunlight. It is desirable that the ambient storage temperature shall not exceed 35°C (95°F).

13. Sampling

13.1 Each roll of sheeting in a lot or shipment shall be subject to inspection and test by the manufacturer including electrical proof test to levels required in **Table 2** or **Table 3** of this specification.