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Flagging of Electrical Grade Tapes

1. DEFINITION

1.1 Flagging is the lifting of an end of a tape that has been applied to a curved surface, thus forming a flag or tab tangent to the surface.

2. SIGNIFICANCE

2.1 This is one method of determining whether such properties as thickness, stiffness, and adhesion have been properly balanced for applications where flagging may occur.

2.2 Procedure A is for determining the flagging characteristic of tapes with non-elastic backings.

2.3 Procedure B is for determining the flagging characteristic of tapes with elastoplastic backings that have both high stretch and substantial recovery.

3. TEST SPECIMENS

3.1 Condition the roll for at least 24 hours prior to testing in an atmosphere maintained at 23°C ± 2°C (73.4°F ± 3.6°F) and a relative humidity (RH) of 50% ± 5% at that temperature. The sample shall be placed so that the conditioning atmosphere shall have free access to all normally exposed surfaces of the sample roll.

3.2 Discard at least three but no more than six outer wraps of the tape from the sample roll.

3.3 For Procedure A remove three strips of tape, about 125 mm (5") in length from each test roll and cut down to 12 mm (0.5") width. Specimens shall be removed from the roll so that the adhesive surface contacts neither the fingers nor any foreign object.

3.4 For Procedure B remove six strips of tape, about 200 mm (8") in length and cut down to 6 mm (0.25") width. Specimens shall be removed from the roll so that the adhesive surface contacts neither the fingers nor any foreign object.

4. EQUIPMENT

4.1 Winding fixture, designed to hold a metal rod at each end and fitted with a crank or other device to rotate the rod so that the specimen may be wound thereon while tilting to an angle of approximately 35° to the horizontal. The fixture shall be attached to a rigid support with the rod held in a horizontal position.

4.2 Rods — Any suitable metal of 3 mm (0.125") or 6 mm (0.25") diameter and 125 mm (5") long. Rods of other diameters may be acceptable if agreed upon between the manufacturer and the customer. For Procedure B three clean brass rods of 3 mm (0.125") diameter are required.

4.3 Calibrated oven, forced air capable of maintaining 130°C ± 2°C (266°F ± 3.6°F). (www.VWR.com).

4.4 Calibrated ruler, graduated in 1 mm (1/32") divisions.

4.5 Calibrated weight, Procedure A requires a mass of 500 ± 1 g with a hook or other means for attaching to the specimen. Procedure B requires a 50 ± 1 g per 0.001" of nominal overall thickness of the tape, with a hook or other means for attaching to the specimen.

4.6 Razor blade.

4.7 A stand, typically a board with 3 mm (0.125"), 6 mm (0.25"), or other diameter holes as agreed upon between the producer and user, spaced approximately 48 mm (2") apart on its surface to provide a base for supporting the wrapped rods in a vertical position.

5. TEST METHODS

5.1 Procedure A

5.1.1 Horizontally mount a rod of a required size in the winding fixture. For tapes of 0.025 mm (0.001") or less of backing thickness, use a 3 mm (0.125") diameter rod. For tapes having backing thickness greater than this, use a 6 mm (0.25") diameter rod.

5.1.2 Attach a 500 g weight to one end of a 125 mm (5") strip of tape. Holding the opposite end of the strip, drape the strip over the rod with the adhesive side contacting and adhering to the rod (see Figure 1). Rotate the rod so that the contact point is at the top of the rod and use a razor blade to trim the leading edge of the strip of tape flush with the rod.

5.1.3 Wind the tape on itself one complete turn, then a further 1/4 turn. Secure the rod from turning. Remove the weight and cut the tape at point D by tearing against the razor blade edge held tangentially against the rod, taking care not to cut the lower layer of tape.

5.1.4 In the case of thermosetting tapes, cure the specimen assembly vertically in an oven for 2 h at 130°C ± 2°C (266°F ± 3.6°F) or for the time and the temperature agreed upon between the manufacturer and the customer. Remove the assembly from the oven and cool to room temperature. See Figure 2.

5.1.5 In the case of nonthermosetting tapes, insert wrapped specimens in holes in the base of the board with the flag at the upper end and allow them to condition at 23°C ± 2°C (73.4°F ± 3.6°F) and a relative humidity (RH) of 50% ± 5% for 24 hours.

5.1.6 In the case of tapes to be evaluated for resistance to solvents, cure the specimen assembly for 2 hours at 130°C ± 2°C (266°F ± 3.6°F) or at an alternate time and temperature agreed upon by the manufacturer and customer. Cool the specimens to room temperature and totally immerse them in a typical varnish solvent or cleaning solvent such as toluene for 15 min.

5.1.7 Measure the length of the unwound tape (flag) from the end of the tape to the point of tangent of the rod to the nearest millimeter (1/32"), as appropriate. If an uneven flag occurs, record the greatest length.

5.2 Procedure B

5.2.1 Secure a strip of tape by thread or light cord to the rod by making a few wraps while the rod is at a 35° angle. This portion may be removed after 5.2.2 is complete so that it is eliminated from the test. With the rod held in a horizontal position, attach the weight specified in 4.5 to the lower end of the tape. After 1 min. under tension, slowly rotate the rod and tilt the fixture approximately 35° degrees to the horizontal so that the strip of tape is wrapped for the length of the rod with successive turns closely butted without overlapping. It may be necessary to adjust the angle of the rod by successive trials until the proper angle for the particular tape is obtained. After wrapping is complete, secure the lower end of the tape and cut off any remaining length.

5.2.2 Then secure a second strip of tape over the first layer to the rod and apply it under tension with the weight specified in 4.5, except that the second layer shall be laterally displaced at 50% register with respect to the first layer. As the winding progresses to the lower end of the rod, insert a short length of lens tissue paper, 3 mm (0.125") wide under the tape across its width and parallel to the axis of the rod to serve as a starting point for the tape to unwind (flag). Remove the winding tension and cut the tape adjacent to the tissue and that then serves as the benchmark for measurement of the unwind length.

5.2.3 Insert the wrapped specimens vertically into the holes in the base of the board with the flag at the upper end, allow them to condition at 23°C ± 2°C (73.4°F ± 3.6°F) and a relative humidity (RH) of 50% ± 5% standard conditions for 7 days. At the end of this period, measure the length of flagging from the point of tangency to the nearest edge of the tissue, to the nearest millimeter (1/32") as appropriate, taking care not to cause additional unwrapping in the measuring operation.

6. REPORT

6.1 Complete identification of the tape.

6.2 In Procedure A, rod diameter used.

6.3 In Procedure A, conditioning procedure used, including solvent type, if used.

6.4 Maximum, minimum, and average length of flag in inches or in millimeters, as appropriate.

Another method for measuring the flagging of electrical grade tapes is ASTM D 1000.

Figure 1. Set-up for procedure B

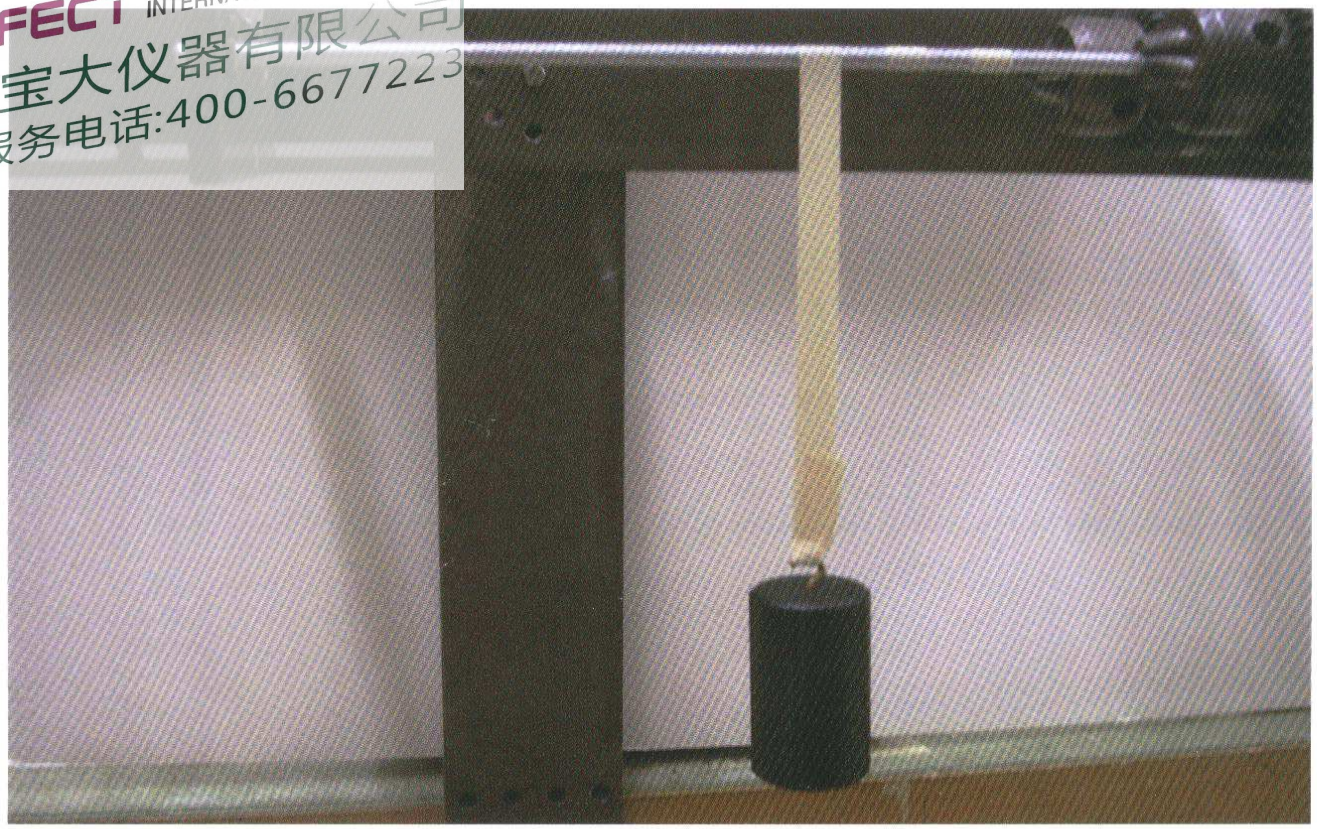

Figure 2. Flagging tape rod 500g weight.

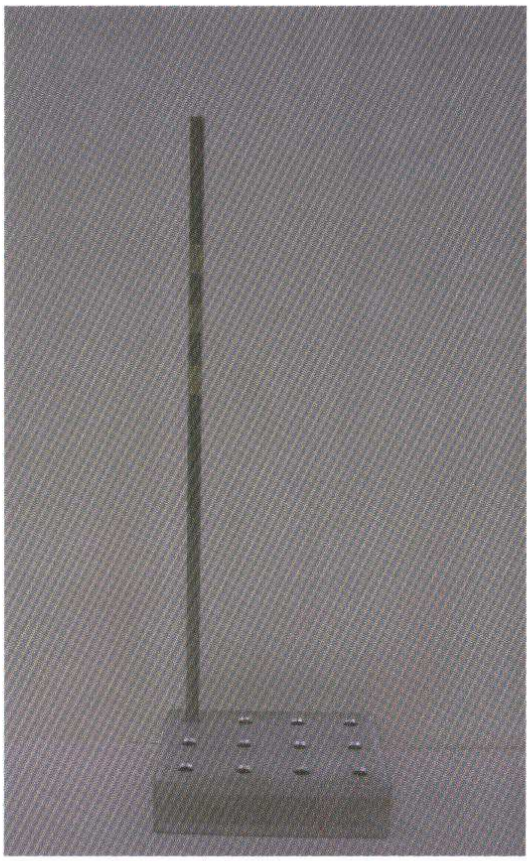

Figure 3. Flagging rod in oven.