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MILITARY SPECIFICATION
INSULATION TAPE, ELECTRICAL, HIGH-TEMPERATURE,
GLASS FIBER, PRESSURE-SENSITIVE

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 This specification covers glass fiber, silicone adhesive, pressure-sensitive tape for construction and repair of electrical equipment operating at high temperatures.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

- QQ-A-225/8 - Aluminum Alloy Bar, Rod, Wire and Special Shapes, Rolled, Drawn, or Cold Finished, 6061.
- PPP-B-576 - Boxes, Wood-Cleated, Veneer, Paper Overlaid.
- PPP-B-585 - Boxes, Wood, Wirebound.
- PPP-B-591 - Boxes, Fiberboard, Wood-Cleated.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-636 - Box, Fiberboard.
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter.
- PPP-T-60 - Tape, Pressure-Sensitive Adhesive, Waterproof-for Packaging and Sealing.
- PPP-T-76 - Tape, Pressure-Sensitive Adhesive, Paper, Water Resistant.
- PPP-T-97 - Tape, Pressure-Sensitive Adhesive, Filament Reinforced.

MILITARY

- MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications.- The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

- D-295 - Methods of Testing Varnished Cloths and Varnished Cloth Tapes Used for Electrical Insulation (Tentative).
- D-374 - Standard Methods of Test for Thickness of Solid Electrical Insulation.

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(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pa.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd St., New York 16, N. Y.)

3. REQUIREMENTS

3.1 Qualification.- The glass fiber, silicone adhesive, pressure-sensitive electrical insulation tape furnished under this specification shall be a product which has been tested, and has passed the qualification tests specified herein, and has been listed on or approved for listing on the applicable qualified products list. Each thickness of material will require separate qualification.

3.2 Materials.- The tape shall consist of glass fiber textile fabricated from continuous filament yarn. The tape shall be coated on one side with a silicone pressure-sensitive adhesive. The tape shall require no heat, moisture, or other preparation prior to or subsequent to application. The adhesive coating shall be smooth and uniform and shall be free of lumps and bare spots. There shall be no separator between adjacent layers of the roll or tape.

3.3 The tape shall be natural in color, shall be 0.007 inch or 0.010 inch thick, as specified (see 6.2) and in widths as follows: 0.50 inch, 0.75 inch and 1.00 inch as specified (see 6.2).

3.4 Rolls.- The tape shall be wound evenly in 36-yard rolls on cores made of paper fiber or plastic. The core shall have sufficient rigidity to prevent distortion of the roll under normal conditions of transportation and use. Where the material is required for application by hand (hand taping), it shall be put up in rolls over a 1-inch diameter core unless otherwise specified (see 6.2). Where the material is required for machine taping, the overall diameter of the roll and the mandrel diameter of the cylindrical core shall be as specified (see 6.2).

3.5 Physical requirements. - The tape shall conform to the physical requirements shown in table I.

Table I - Physical requirements.

Property to be tested (for conditioning, see 4.7)	Test paragraph	Unit of value	Value required (10-mil-nominal thickness)	Value required (7 mil-nominal thickness)
Length per roll	4.8.2	Yards	36 min.	36 min.
Thickness	4.8.3	Inches	0.010 ± 0.001	0.007 ± 0.001
Width	4.8.4	Inches	0.5; 0.75; 1.0 ± 0.06	0.5; 0.75; 1.0 ± 0.06
Thread count	4.8.5	Threads per inch	$\frac{1}{1}$	$\frac{1}{1}$
Tensile strength	4.8.6	Pounds per inch width	150 min.	150 min.
Unwinding force	4.8.7	Ounces	80 max.	80 max.
Adhesion to steel	4.8.8	Ounces per inch width	16 min.	20 min.
Adhesion to backing	4.8.9	Ounces per inch width	12 min.	12 min.
Thermal stability of adhesive: To backing C-168/23/50 To steel C-168/23/50	4.8.10	Ounces per inch width Ounces per inch width	(To be recorded) (To be recorded)	(To be recorded) (To be recorded)
To backing E-168/250 To steel E-168/250		Ounces per inch width Ounces per inch width	{ Greater than or equal to value obtained after C-168/23/50	{ Greater than or equal to value obtained after C-168/23/50
Holding power to steel	4.8.11	Inches per hour	0.050 max.	0.050 max.
Holding power to backing	4.8.12	Inches per hour	0.050 max	0.050 max.
Dielectric breakdown: C-96/23/0 C-96/23/96	4.8.13	Volts Volts	4000 min. 3000 min.	2000 min. 1500 min.
Effect of high temperature aging on dielectric break- down: C-168/23/50	4.8.14	Volts	(To be recorded)	(To be recorded)
E-168/250		Volts	{ Greater than or equal to value obtained after C-168/23/50	{ Greater than or equal to value obtained after C-168/23/50
Indirect electrolytic corro- sion: Individual reading	4.8.15	Micromicromhos per inch width	8.0 x 10 ⁴ max.	8.0 x 10 ⁴ max.
Median reading		Micromicromhos per inch width	4.0 x 10 ⁴ max.	4.0 x 10 ⁴ max.
Flagging: C-336/23/50	4.8.16	Inch	0.125 max.	0.125 max.

$\frac{1}{1}$ / For information only.

3.6 Workmanship. - The workmanship shall be in accordance with high grade manufacturing practice for this type of product. The glass fiber backing shall not ravel and there shall be no adhesive transfer when the tape is unwound from the original roll.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the

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specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Qualification^{1/}. - Qualification tests shall be conducted at a laboratory satisfactory to the Bureau of Ships. Qualification tests shall consist of the tests specified in 4.4.2.

4.3 Classification of inspection. - The inspection of tape shall be classified as follows:

- (a) Qualification tests.
- (b) Examination.
- (c) Quality conformance tests.

4.4 Qualification tests. -

4.4.1 Sampling instructions. - The qualification test samples shall consist of 12 one-inch wide rolls of tape at least 36 yards in length of the thickness for which qualification is desired.

4.4.2 Qualification tests. - The qualification tests shall consist of all tests listed in table I except that length per roll need not be determined. The results obtained from one specimen prepared from each of 10 sample rolls for each test shall be averaged except that one specimen prepared from each of 5 sample rolls shall be averaged for the flagging test (see 4.8.16). A failure of the average to conform with any of the applicable requirements shall be considered as failure of the qualification test sample.

4.5 Sampling for quality conformance. -

4.5.1 Inspection lot. - All rolls of tape of the same width and thickness manufactured under essentially the same conditions within a period of 15 days and offered for delivery at the same time shall be considered a lot for purposes of inspection.

4.5.2 Sampling for examination. - A random sample of rolls of tape shall be selected from each lot of material offered for examination of visual and dimensional characteristics in accordance with Standard MIL-STD-105 at inspection level I and Acceptable Quality Level equal to 2.5 percent defective.

4.5.3 Sampling for quality conformance tests. - A random sample of rolls shall be selected in accordance with table II and shall be subjected to the tests specified in table III.

Table II - Sampling for quality conformance tests.

Number of rolls in lot	Minimum number of rolls for quality conformance tests
500 or under	2
501 to 1,300	3
1,301 to 3,200	4
3,201 and over	5

4.6 Inspection. -

4.6.1 Examination. - Each of the sample rolls selected in accordance with 4.5.2 shall be visually and dimensionally examined to verify compliance with the requirements of this specification not involving tests (see 4.8.2, 4.8.3, and 4.8.4). Any roll in the sample containing one or more visual or dimensional defects shall not be offered for delivery. If the number of defective rolls in any sample exceeds the acceptance number for that sample, this shall be cause for rejection of the lot represented by the sample.

^{1/}Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification" (see 6.3 and 6.4).

4.6.2 Quality conformance tests.- Quality conformance tests shall be conducted on samples selected in accordance with table II. Each sample roll shall be subjected to tests specified in table III. Ten determinations shall be made for each test with the determinations distributed approximately equally among the sample rolls. The results shall be averaged to determine conformance with this specification. If any averaged result fails to conform with any requirement of this specification, this shall be cause for rejection of the lot.

Table III - Quality conformance tests.

Property to be tested (for conditioning, see 4.7)	Test paragraph
Thread count	4.8.5
Tensile strength	4.8.6
Adhesion to steel	4.8.8
Thermal stability of adhesive:	
To steel C-168/23/50	4.8.10
To steel E-168/250	4.8.10
Holding power to steel	4.8.11
Dielectric breakdown:	
C-96/23/0	4.8.13
C-96/23/96	4.8.13
Effect of high temperature aging on dielectric breakdown:	
C-168/23/50	4.8.14
E-168/250	4.8.14

4.7 Test conditions.

4.7.1 Sample rolls.- The first 3 turns of tape shall be removed and discarded from each sample roll of tape selected prior to testing.

4.7.2 Conditions.- Unless otherwise specified herein, all tests shall be conducted under conditions of 23 degrees \pm 1.10 degrees Centigrad (C.) and 50 \pm 1 percent relative humidity.

4.7.3 Designation.- Conditioning procedures shall be designated as follows:

- (a) A capital letter indicating the general condition of the specimen, "C" indicates humidity and "E" indicates temperature conditioning.
- (b) A number indicating in hours the duration of the conditioning.
- (c) A number indicating in degrees C. the conditioning temperature.
- (d) A number indicating relative humidity whenever relative humidity is controlled.

The numbers shall be separated from each other by slant marks, and from the capital letter by a dash.

Examples:

- C-96/23/0 - 96 hours, 23 degrees C., over dry calcium chloride (shown on 0 percent relative humidity).
- C-168/23/50 - 168 hours, 23 degrees C., 50 percent relative humidity.
- C-336/23/50 - 336 hours, 23 degrees C., 50 percent relative humidity.
- E-168/250 - 168 hours, 250 degrees C.

4.8 Test methods.

4.8.1 Tape shall be examined to determine conformance with the requirements for materials (see 3.2), color (see 3.3), rolls (see 3.4), workmanship (see 3.6), and dimensions (see 4.8.2, 4.8.3 and 4.8.4).

4.8.2 Length per roll.- The sample roll of tape shall be weighed to the nearest 0.1 gram after the core has been removed. A specimen of tape, approximately 3 feet long, shall be removed from the roll, placed on

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a smooth flat surface and the length measured to the nearest 0.1 inch. The specimen shall then be weighed to the nearest milligram, and yards per roll calculated as follows:

$$\text{Yds. per roll} = \frac{\text{Wt. of roll (less core)}}{\text{Wt. specimen}} \times \frac{\text{Length specimen}}{36}$$

4.8.3 Thickness. - The test specimen consisting of a single thickness of tape not less than 18 inches long shall be placed smoothly, adhesive side up, on the anvil of a dial-type micrometer. The presser foot shall be lowered upon the tape gradually (without impact) and allowed to rest upon it for 2 seconds and then the reading shall be observed. The thickness gauge used for measurement of thickness shall be a dead weight dial micrometer meeting the requirements established in method "C" of ASTM Designation D374-42 with the following exceptions:

- (a) The gauge shall be equipped with a 1/4 inch diameter presser foot and a 1-1/2 inch to 2 inch diameter anvil.
- (b) The presser foot and moving parts connected therewith shall be weighted so as to apply a total load of 6 ounces \pm 0.1 ounce (equivalent of 7.6 pounds per square inch (p.s.i.)) to the specimen.

The thickness of the tape shall be reported to the nearest 0.0001 inch.

4.8.4 Width. - The width of the tape shall be measured with a standard steel scale graduated in 0.01 inch. The tape shall lie flat on a smooth surface at the time of measurement.

4.8.5 Thread count. - The number of warp and filler threads per inch shall be determined.

4.8.6 Tensile strength. -

4.8.6.1 Apparatus. - Tensile strength shall be determined on a dead weight pendulum testing machine. The machine shall be preferably power-driven and equipped with a tension-weighting device having a maximum capacity of 500 pounds, graduated to read 1 pound or less (preferably 0.5 pound or less) per scale division.

4.8.6.2 Specimen holders. - The preferred fixture for holding the test specimens shall be two metal cylinders, 2 inches in outside diameter by approximately 1-1/2 inches long. Both cylinders shall be arranged to revolve so that the specimen can be wrapped on them and shall be equipped with a locking device to prevent revolving during test. The fixture shall be offset on each head of the machine to provide alignment of the periphery of each cylinder with the center axis of the tensile machine.

4.8.6.3 Procedure. - Test specimens shall be held in place for test by smoothly wrapping the specimen 270 degrees around each cylinder, with the adhesive side of the specimen toward each cylinder. The length of the specimen between tangent points on the cylinders shall be 5 plus or minus 1/4 inches. The rate of jaw separation shall be constant and shall be 12 inches per minute. All breaks obtained at point of fixture contact shall be rejected.

4.8.7 Unwinding force -

4.8.7.1 Apparatus. -

4.8.7.1.1 Any suitable mechanically-driven device equipped with an indicator or preferably with a recorder to show unwinding force shall be used. A working range not to exceed 20 pounds with readings in not more than 0.1 pound increments is preferred.

4.8.7.1.2 A device consisting of a free turning mandrel mounted in a yoke suitable for clamping in the unwinding apparatus.

4.8.7.2 The core of the specimen roll shall be fitted snugly on the free turning mandrel. Two feet of tape shall be unwound at the rate of 20 feet per minute and the resulting curve averaged to give unwinding force.

4.8.8 Adhesion to steel.-**4.8.8.1 Apparatus.-** The following apparatus shall be required:

- (a) A dead weight pendulum or crosshead-type tensile tester, preferably power driven and with a recording device, with at least a 10-inch jaw separation shall be used. A working range of from 0 to 10 pounds with readings in not more than 0.1 pound increments is preferred.
- (b) Cold rolled, corrosion-resisting steel strip, grade 2, type 302 (ASTM designation A167-44), 1/16 inch by 2 inches by 5 inches, finished in the lengthwise direction with a number 150 grit belt as standardized by the stainless steel industry shall be used.
- (c) Steel roller, 3.25 ± 0.1 inches in diameter, by 1.75 ± 0.05 inches in width, covered with rubber approximately 1/4 inch thick having a durometer hardness of 80 ± 5 . The weight of the complete assembly shall be 4.5 ± 0.1 pounds.

4.8.8.2 Specimen.- The specimen shall be a 10-inch length of tape removed from the roll so that neither surface contacts either the fingers or any other foreign object. The test specimen shall be removed at a 90-degree pull-off angle at a rate of approximately 20 feet per minute. The test rolls shall be subjected to condition C-96/23/50 prior to removal of test strips.

4.8.8.3 Procedure.- Before each test, the polished surface of the plate shall be washed thoroughly with heptane, trichlorethylene, or other suitable solvent, using a clean piece of lintless wiping tissue for each washing. After all traces of the solvent have evaporated, the surface of the plate shall be wiped with a clean dry piece of tissue. Tissues shall contain no size or wet-strength treatment. Immediately after removing the specimen from the roll, it shall be applied, adhesive side down, to the polished surface of the plate. The specimen shall be applied so that a 5-inch length shall extend beyond one end of the plate. In the case of tapes less than 1 inch in width, other strips shall be cut from the same sample roll and applied parallel and adjacent to the test specimen to provide a total width of approximately one inch. The roller, without application of additional pressure, shall be passed over the backing of the tape, once in each direction at a rate of approximately 2 inches per second. After the tape has remained on the plate for 20 ± 5 minutes, the free end of the test specimen shall be doubled back at an angle of 180 degrees and one inch of the tape peeled off the plate. This portion of the exposed plate shall be clamped in the lower jaw and the free end of the tape in the upper jaw. The driven jaw shall move at a rate of 12 inches per minute. The pawls of the testing machine shall be disengaged to provide a free swinging pendulum during test. If no recording device is used, the first inch of tape shall be removed from the plate and five readings shall be taken at approximately 1/2-inch intervals. No readings shall be taken during the removal of the last inch of tape from the plate. The average force, in ounces per inch width of tape, required to remove the tape from the plate, shall be calculated from the five readings and shall be considered one specimen reading. If a recording device is employed, readings shall be recorded after the first inch and before removal of the last inch of tape from the plate. The resulting curve reading for the adhering 2 inch length of tape shall be averaged by means of a polar planimeter or other suitable device and this averaged figure considered as one specimen reading.

4.8.9 Adhesion to backing.-

4.8.9.1 Procedure.- The test shall be conducted in the same manner as adhesion to steel except that a strip of tape from the same roll being tested shall first be affixed to the plate with both ends wrapped around either end onto the back of the plate. The test specimen shall then be applied directly on top of each strip of tape adhering to the plate in the same manner as described in 4.8.8.3 and adhesion to backing measured immediately on the top layer of tape.

4.8.10 Thermal stability of adhesive.-**4.8.10.1 Apparatus.-** Apparatus shall consist of the following:

- (a) A device as shown in figures 1 and 2 which shall consist of a removable corrosion-resisting steel drum mounted on frictionless bearings in a yoke suitable for clamping in the lower jaw of a tensile testing machine.
- (b) Corrosion-resisting steel drums cut 1-1/2 inches long from tubing 2-1/4 inches outside diameter. The outer surface of the drum shall be polished in the circumferential direction with 150-grit dry silicon carbide paper. Polishing can be readily accomplished by rotation of the drum mounted in a small lathe or drill press while a strip of silicon carbide is manually held to its surface.
- (c) A tensile strength machine as specified in 4.8.8.1(a).

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4.8.10.2 Test specimens.- Specimens shall be 15-inch lengths of tape as removed from the roll for adhesion to the steel drum and 20-inch lengths for adhesion to backing.

4.8.10.3 Procedure.- The yoke shall be mounted in the lower jaw of the tensile tester so that the center of the drum will be directly below the upper jaw and a clean polished drum shall be clamped in the frame. Three turns of flexible cord shall be wound in the groove of one of the clamping discs holding the drum, and the end of the cord attached to the upper jaw of the tensile tester. One end of a 15-inch tape specimen shall then be affixed to point "X" on the surface of the drum in the opposite direction to the cord winding. A weight shall then be attached to the lower end of the specimen to provide a tension of 8 pounds per inch width. The tensile machine shall be started and exactly one complete turn of the tape shall be thus wound up on the drum at a speed of 12 inches per minute. It is important that no more than one complete layer be applied, since additional turns or parts of turns affect the adhesion of the layer below on some tapes. With the machine stopped, the weight shall be left suspended for one minute and then removed. Twenty wrapped specimens shall be prepared. Ten shall be stored for 168 hours at $23 \pm 1^\circ\text{C}$. and 50 percent relative humidity and ten specimens shall be placed in a $250 \pm 5^\circ\text{C}$. oven for the same period within 1 hour after being wrapped. Oven specimens shall then be removed and cooled for 4 hours at $23 \pm 1^\circ\text{C}$. and 50 percent relative humidity. The specimens shall then be placed, in turn, in the yoke and the free end of the tape attached to the upper jaw. The tensile machine shall be operated at 12 inches per minute so that the tape is pulled off the drum at 90 degrees to the surface of the drum. A recorder should be used to indicate adhesion or the method of periodic readings described in 4.8.8.3 may be employed. In any case, readings closer than 1 inch to either end of the specimen shall not be considered.

4.8.10.3.1 In a similar manner twenty 20-inch long specimens shall be prepared with exactly two turns of tape on the drum. These shall be stored or aged in the same manner as the other twenty, and the outer layer pulled off to give adhesion to backing.

4.8.10.3.2 The recorded or periodic readings for the adhesion to steel drum specimens shall be averaged for the room temperature conditioned and aged specimens respectively. Similar averages shall be made for adhesion to backing.

4.8.11 Holding power to steel.-

4.8.11.1 Test panels.- Test panels shall consist of cold-rolled, corrosion-resisting steel, grade 2, type 302 (ASTM designation A167-44), 2 inches by 4 inches by 1/16 inch, polished in the lengthwise direction with 280 grit dry silicon carbide paper, cleaned with heptane, trichlorethylene or other suitable solvent, and thoroughly dried.

4.8.11.2 Procedure.- A six inch tape specimen shall be applied to one end of a clean steel panel so that an area of one square inch is in contact with the panel. The free end shall be folded over on itself, adhesive side in, and the tape shall be rolled once in each direction with a roller specified in 4.8.8.1(c), in such a manner that only the weight of the roller rests on the tape, and at the rate of 12 inches per minute. For tapes less than one inch in width, other strips shall be cut from the same sample roll and applied parallel and adjacent to the test specimen to provide a total width of approximately one inch. The steel panel shall be clamped in a vertical (± 2 degrees) position with the tape hanging from the bottom edge. A 1000 gram weight shall be applied to the folded end. At the end of one hour, the specimen shall be examined and any creeping or slippage shall be measured.

4.8.12 Holding power to backing.-

4.8.12.1 Test panels.- Test panels shall be of the same type and shall be similarly prepared as specified in 4.8.11.1.

4.8.12.2 Procedure.- The test shall be conducted in the same manner as holding power to steel except that a strip of the tape from the same roll being tested shall be affixed lengthwise to the steel panel with an excess of approximately 1 inch wrapped around either end onto the back of the panel. The test specimen shall then be applied directly on top of the strip of tape adhering to the panel in the same manner as described in 4.8.11.2 and holding power to backing measured immediately on the top layer of tape.

4.8.13 Dielectric breakdown.-

4.8.13.1 Apparatus.-

4.8.13.1.1 Any well designed, high tension transformer connected to an alternating current supply, having as nearly a true sine wave as possible may be used. The transformer and the source of supply of energy shall not be less than 2 kilovolt amperes (KVA). The frequency shall not exceed 100 cycles per second. Regulation shall be so controlled that the high-tension testing voltage taken from secondary of the testing transformer can be raised gradually from any point and in no case more than 500 volts at a step. The control may be made by generator field regulation, with an induction regulator or with a variable ratio autotransformer. Any method of regulating the voltage which will not distort the wave more than 10 percent from sinusoidal shape will be satisfactory.

4.8.13.1.2 The voltage may be measured by any satisfactory method which will give root-mean square values, preferably by means of a voltmeter connected to a well designed tertiary coil in the testing transformer or to a separate stepdown transformer.

4.8.13.2 Electrodes.-

4.8.13.2.1 The electrodes shall be opposing cylindrical rods 1/4 inch in diameter with edges rounded to a radius of 1/32 inch. The upper movable electrode shall weigh 0.1 ± 0.005 pound.

4.8.13.2.2 For the tests, it shall be necessary to use a special form of testing device with 1/4 inch diameter electrodes, whereby the test specimens shall be clamped under pressure in order to prevent flashover around the edges of the material. (Note.- Two forms of these testers are described in the Appendix to ASTM-D-295.)

4.8.13.3 Specimens.- The test specimens shall be of sufficient size that will prevent flashover

4.8.13.4 Procedure.- The specimens of each sample of material shall be subjected to conditions C-96/23/0 and C-96/23/96. The tests shall be made with the specimens in air at the conditioning temperature. Tests shall be made by the short-time test method on a single tape specimen with the adhesive side down. Special attention shall be given to keeping the electrodes clean. Starting at zero, the voltage shall be increased uniformly to breakdown at the rate of 500 volts per second.

4.8.14 Effect of high temperature aging on dielectric breakdown.-

4.8.14.1 Apparatus.- The transformer and associated equipment described in 4.8.13.1 shall be used.

4.8.14.2 Specimens.- Test specimens shall consist of two layers of tape spirally butt-wound on 1/2 inch diameter brass mandrels for approximately 4 inches. The top layer shall be half-lapped upon the bottom layer.

4.8.14.3 Procedure.- Specimens shall be kept at condition C-168/23/50 and other specimens heat-aged at E-168/250 removed from the ovens and cooled at condition C-4/23/50. After conditioning and aging, a 1-inch wide strip of metal foil shall be wrapped around the center of each specimen as an outer electrode and the brass mandrel shall serve as the inner electrode. Starting at zero, the voltage shall be increased to breakdown at a rate of 500 volts per second.

4.8.15 Indirect electrolytic corrosion.-

4.8.15.1 Apparatus.-

4.8.15.1.1 Electrodes.- The electrodes shall be 1/4 inch square brass or copper rods having the side in contact with the tape polished smooth and flat and the corners lightly rounded. The electrodes shall be mounted in such a way that the tape under test will be clamped between pairs spaced one inch edge-to-edge and shall be guarded so that only the current flowing along the tape will be measured.

4.8.15.1.2 Measuring equipment.- The measuring equipment shall consist of a source of reasonably constant direct current (d.c.) voltage within the range 100 to 130 volts and a means of measuring currents ranging from 0.001 to 1000 microamperes. Dry cells or shop lines are satisfactory voltage sources. A galvanometer having a sensitivity of 0.001 microampere per one millimeter deflection and equipped with an Ayrton

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shunt is satisfactory for measuring the current. A d.c. conductance bridge or any other conductance or resistance measuring instrument which will impress the required voltage on the sample and cover the required conductance range is also satisfactory.

4.8.15.2 Procedure.- The surface of the electrodes in contact with the tape shall be polished and cleaned before each test. A satisfactory method is to polish with No. 0 emery polishing paper, rinse in acetone and then wipe with cleaning tissue. Strips of tapes, not exceeding 1 inch in width, shall be tested. The section placed between the electrodes shall not be touched by hands. The bar electrodes shall be evenly and firmly clamped over the tape. The tape mounted in the electrodes shall be conditioned 18 hours at a relative humidity of 96 ± 2 percent at 23°C . At the end of the conditioning period, the conductance of the tape, between each adjacent pair of electrodes, shall be measured while still in the humidity chamber. Readings shall be taken 1 minute after impressing 100 to 130 volts d.c. between the electrodes. The maximum individual reading and the median reading shall be reported.

4.8.16 Flagging.-

4.8.16.1 Specimens.- Test specimens shall consist of 2 layers of tape spirally butt wound on a 1/8 inch diameter brass mandrel wherein the top layer shall be half-lapped upon the bottom layer. These specimens shall be prepared as follows:

- (a) The tape shall be removed from the roll and cut to 1/4 inch width. Care shall be rigidly observed so that the adhesive shall not contact the hands or any foreign object. A 1/4 by 8 inch die shall be employed for cutting the tapes adhesive side up.
- (b) A winding jig shall be attached to a rigid support in such a manner that it could be rotated while supporting an 1/8 inch diameter brass rod approximately 35° from the horizontal. One strip of the die-cut tape shall be secured to the upper end of the rod and a weight attached to the lower end. The weight shall be 7/8 pound for 0.007 inch thick tape and 1-1/4 pounds for the 0.010 inch thick tape. After one minute under tension the rod shall be slowly rotated and the tape shall be butt wrapped the length of the rod. The lower end of the wrapped strip shall be secured by thread or light cord and the remaining length cut off. A second strip of tape shall be secured over the first layer at the upper end of the rod with a light cord to prevent both layers from unwinding. The same weight as above shall be applied to the end of the tape strip and it shall be butt wound as a second layer, half-lapping the first layer. As the winding approaches the lower end of the rod a short strip of 1/8 inch wide lens tissue shall be inserted under the tape across its width and parallel to the axis of the rod to serve as the starting point for the tape to unwind or flag. The winding tension shall be relieved and the excess tape shall be cut adjacent to the tissue strip, the latter serving as a bench mark to measure the unwind.

4.8.16.2 Procedure.- Rod specimens thus prepared shall be conditioned in an upright position, the flag at the upper end, in a draft-free area for 14 days at 23°C . and at 50 percent relative humidity. At the end of this period the length of flagging or unwinding shall be measured from the point of tangency to the nearest edge of tissue. The average unwinding length of 5 specimens shall be recorded.

4.9 Inspection of preparation for delivery.- The packaging, packing, and marking shall be examined to determine compliance with the requirements of section 5 of this specification.

5. PREPARATION FOR DELIVERY

5.1 Packaging.- Packaging shall be level A or C, as specified (see 6.2).

5.1.1 Level A.-

5.1.1.1 Individual rolls.- Each roll, wound on cores as specified (see 3.4), shall be individually packaged in a metal, fiber, or other suitable container. Rolls narrower than 3/4 inch may be packed two rolls per container. A coated separator shall be provided between rolls and between rolls and the container top and bottom to prevent sticking. A centering device shall be provided in each individual container to prevent the outside diameter of tape roll from contacting the sides of the container. Containers shall contain tape of one width and thickness only. Individual rolls of tape, packaged as above, shall be further packaged in a box conforming to Specification PPP-B-636 and closed in accordance with the appendix thereto. Gross weight shall not exceed 65 pounds.

5.1.1.2 Multiple rolls.- Multiple quantity of rolls, without individual containers, as specified (see 6.2), shall be furnished in full slip cover cans conforming to type VI of Specification PPP-C-96 and sealed with pressure sensitive tape conforming to Specification PPP-T-60, or in a fiber box conforming to Specification PPP-B-636. Box closure shall be as specified in the box specification or appendix thereto. All joints and corners shall be sealed with 1-1/2 inch wide pressure sensitive tape conforming to Specification PPP-T-76.

5.1.2 Level C.- Packaging shall be sufficient to afford adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice when such meets the requirements of this level.

5.2 Packing.- Packing shall be level A, B or C, as specified (see 6.2).

5.2.1 Level A.- Tapes of one width and thickness, packaged as specified (see 6.2), shall be packed in overseas type, wood cleated fiberboard, nailed wood, fiber, wirebound wood, wood cleated veneer paper overlaid, or wood cleated plywood boxes conforming to Specification PPP-B-591, PPP-B-621, PPP-B-636, class 2, PPP-B-585, PPP-B-576, class 2, or PPP-B-601, respectively, at the option of the contractor. Shipping containers shall have case liners conforming to Specification MIL-L-10547. Case liners shall be closed and sealed in accordance with the appendix to Specification MIL-L-10547. Case liners for boxes conforming to Specification PPP-B-636 may be omitted provided all joints and corners of the boxes are sealed with minimum 1-1/2 inch wide tape conforming to Specification PPP-T-76. Boxes shall be closed and strapped in accordance with the applicable box specification or appendix thereto, except fiber boxes shall be banded with tape conforming to type III of Specification PPP-T-97 and the appendix thereto. The gross weight of wood or wood cleated boxes shall not exceed 200 pounds; fiber boxes shall not exceed the weight limitations of the applicable box specification. Unit or intermediate fiber boxes conforming to class 2 of Specification PPP-B-636, closed and banded as specified herein and used as the shipping container, need not be overpacked.

5.2.2 Level B.- Tapes of one width and thickness, packaged as specified (see 6.2) shall be packed in domestic type wood cleated fiberboard, nailed wood, wirebound wood, cleated plywood or wood cleated veneer paper overlaid boxes or class 2 fiber boxes conforming to Specification PPP-B-591, PPP-B-621, PPP-B-585, PPP-B-601, PPP-B-576, class 1, or PPP-B-636, respectively, at the option of the contractor. Box closure shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood or wood cleated boxes shall not exceed 200 pounds; fiber boxes shall not exceed the weight limitations of the applicable box specification. Intermediate fiber boxes conforming to Specification PPP-B-636, closed as specified herein and used as the shipping container, need not be overpacked.

5.2.3 Level C.- Tape, packaged as specified (see 6.2), shall be packed in containers which will insure acceptance by common carrier and safe delivery at destination. Shipping containers shall conform to the Uniform Freight Classification Rules or other regulations as applicable to the mode of transportation.

5.3 Marking.- In addition to any special marking required by the contract or order or herein, interior packages and shipping containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Intended use.- Glass fiber, silicone adhesive pressure-sensitive tape is intended principally for securing coils and electric windings where tape having good high-temperature-resistant adhesive and backing is required.

6.2 Ordering data.- Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Thickness and width required (see 3.3).
- (c) If required for machine taping, the overall diameter of roll and the mandrel diameter of the cylindrical core; if required for application by hand (hand taping), the inside diameter of the cylindrical core (see 3.4).
- (d) Applicable levels of packaging and packing required (see 5.1 and 5.2).

6.3 With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List QPL-19166, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they

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propose to offer to the Federal Government tested for qualification, in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the Bureau of Ships, Department of the Navy, Washington 25, D. C., and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification" (see 6.4).

6.4 Copies of "Provisions Governing Qualification" may be obtained upon application to Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia 20, Pa."

6.5 Certain provisions of this specification are the subject of international agreements (ABC-NAVY-STD-17). When amendment, revision or cancellation of this specification is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken respecting the International agreement concerned

Custodians:

Army - EL
Navy - Ships
Air Force - SGEES

Preparing activity:

Navy - Ships
(Project 5970-0113)

International interest (see section 8)



Figure 1 - Adhesion to Backing Equipment

