

HH-I-553C
 December 23, 1975
 SUPERSEDING
 HH-I-553B
 March 12, 1973

FEDERAL SPECIFICATION

INSULATION TAPE, ELECTRICAL (RUBBER, NATURAL AND SYNTHETIC)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers rubber insulating tape for splicing wires and cables operating at both normal and high voltages.

1.2 Classification. Insulation tape shall be furnished in the following grades, widths, and lengths and identified by a type designation No.

1.2.1 Type designation No. Insulation tapes covered by this specification shall be identified by a type designation No., formed as indicated below. This type designation No. is intended for cataloging and ordering purposes and not for surface printing on the insulation tape (see 6.1).

HH-I-553	-	A	-	1	-	30
Spec.		Grade		Width		Length
No.		of tape		of tape		of tape
(1.2.2)		(1.2.3)		(1.2.4)		(1.2.5)

1.2.2 Insulation tape Specification No. HH-I-553.

1.2.3 Grade of insulation tape shall be as indicated below:

- A - Ozone resistant, 130° C. (266° F.).
- B - Regular, 600 volts max. 80° C. (176° F.).

1.2.4 Width of tape shall be indicated as follows (see table I):

- 1 - 3/4 inch (20 mm).
- 2 - 1 inch (25.4 mm).
- 3 - 1-1/2 inches (40 mm).
- 4 - 2 inches (50.8 mm).
- 5 - 4 inches (101.6 mm).

1.2.5 Length of tape shall be indicated as follows (see table I):

- 15 - 15 feet long (4.57 m).
- 30 - 30 feet long (9.14 m).

2. APPLICABLE DOCUMENTS

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

Federal Specifications:

- PPP-B-566 - Boxes, Folding, Paperboard.
- PPP-B-636 - Boxes, Shipping, Fiberboard.

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Federal Standards:

Fed. Test Method Std. No. 228 - Cable and Wire Insulated; Methods of Testing.
 Fed. Test Method Std. No. 601 - Rubber: Sampling and Testing.
 Fed. Std. No. 123 - Marking for Shipment (Civil Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

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

(Copies of Military Specifications and Standards 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 a specific issue is identified, the issue in effect on date of invitation for bids, or request for proposal shall apply.

American Society for Testing and Materials (ASTM):

ASTM D 119 - Rubber Insulating Tape.
 ASTM D 150 - Standard Methods of Test for A-C Loss Characteristics and Dielectric Constant (Permittivity) of Solid Electrical Insulating Materials.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Tariff Order Section, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Material.3.1.1 Tape.

3.1.1.1 Grade A tape. The grade A tape shall consist of an unvulcanized self-amalgamating compound of natural rubber, synthetic rubber or a mixture of the two.

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3.1.1.2 Grade B tape. The grade B tape shall consist of an unvulcanized or partially vulcanized compound of natural rubber, synthetic rubber or a mixture of the two.

3.2 Physical requirements.

3.2.1 Dimensions. The tape shall conform to the requirements in table I.

3.2.1.1 Thickness. The tape shall be 0.030 ± 0.003 inches thick when tested as described in paragraph 4.3.1.

3.2.1.2 Width. The width of the tape shall be as specified by the Type Designation No. (see 6.2) within $\pm 1/32$ inch when tested as described in paragraph 4.3.2.

3.2.1.3 Length. The minimum length of the tape shall be as specified by the Type Designation No. (see 6.2) when tested as described in paragraph 4.3.3.

3.2.2 Tensile strength. The tensile strength for grades A and B tape, shall be in accordance with 4.4.1.

3.2.3 Ultimate elongation. The ultimate elongation of the tape shall be not less than 800 percent for grade A tape and not less than 300 percent for grade B tape when tested as described in 4.4.2.

3.3 Fusion.

3.3.1 Grade A tape When tested as described in 4.4.3.1, grade A tape shall not be able in any way to be delaminated without causing rupture of the material.

3.3.2 Grade B tape. The grade B tape shall be in accordance with 4.4.3.2.

3.4 Tackiness. Grades A and B tape shall show no tendency to unwind from the mandrel when tested as described in 4.4.4.1 and 4.4.4.2 respectively.

3.5 Dielectric strength.

3.5.1 Grade A tape. The dielectric strength of the tape shall be not less than 750 volts per mil of thickness when tested as in 4.4.5.

3.5.2 Grade B tape The dielectric strength of the tape shall be not less than 350 volts per mil of thickness when tested as in 4.4.5.

3.6 Ozone resistance, grade A tape. Grade A tape shall not crack when tested as described in 4.4.6.

3.7 Resistance to low temperature. Grades A and B tapes shall show no evidence of splitting, cracking, crazing, or delaminating when tested as described in 4.4.7.

3.8 Workmanship. The tapes shall have smooth and even surfaces, free from cracks and rough edges, and shall be tightly wound in rolls of uniform width:

3.9 Fire and casualty hazards.

3.9.1 Each bidder shall submit to the contracting agency proof that the Grade B tape he proposes to supply under this specification conforms to the requirements of American Society for Testing and Materials, Standard D119 Rubber Insulating Tape. The proof may be accepted as evidence that the tape conforms to this requirement.

3.9.2 Compliance with the above preliminary requirements does not absolve the bidder from complete compliance with the requirements of this specification in order to secure acceptance of his material.

3.10 Dissipation factor and dielectric constant, grade A tape. Grade A tape shall have a dissipation factor of less than 0.05 and a dielectric constant of less than 3.5 when tested as described in 4.5 and 4.6 respectively.

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3.11 Effect of heat, grade A tape. Grade A tape shall not split, crack, craze, delaminate, or flow when tested as described in 4.7.

3.12 Flexibility after heat aging, grade A tape. Grade A tape shall not split, crack, craze, or delaminate when tested as described in 4.8.

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 in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling.

4.2.1 Lot. All insulation tape of the same grade width and length offered for delivery at one time shall be considered a lot for purposes of examination.

4.2.2 Sampling for inspection. Random samples of the insulation tape shall be selected from each lot in accordance with MIL-STD-105. The samples, for purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of rolls of tape. The inspection level shall be S-1. The AQL shall be 2.5 expressed as defects per 100 units.

4.3 Inspection. Each unit in the sample for inspection, 4.2.2, shall be inspected for dimensions, workmanship, and separator.

4.3.1 Thickness. The minimum and maximum thickness of the tape shall be determined in accordance with ASTM D119.

4.3.2 Width. The average width of the tape shall be determined in accordance with ASTM D-119.

4.3.3 Examination of the assembled roll of tape for average length per roll. The sample unit for this examination shall be one finished assembled roll of tape. The roll of tape shall be weighed to the nearest 1/10 of a gram, after the core has been removed. A specimen of tape with separator, approximately 3 feet long, shall be removed from the roll and placed on a smooth flat surface. The specimen shall be allowed to relax to remove any latent elongation induced by the tension exerted on the tape in the roll or during unwinding. The relaxed length shall be measured to the nearest 1/10th of an inch. The specimen shall be weighed and the yards per roll shall be calculated as follows:

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

4.4 Tests. Specimens for test shall be taken at least 2 feet from either end of the roll. Each test unit in the sample shall be tested as follows.

4.4.1 Tensile strength. The tensile strength of the tape shall be determined in accordance with ASTM D119.

4.4.2 Elongation. The elongation of the tape shall be in accordance with ASTM D119.

4.4.3 Fusion.

4.4.3.1 Grade A tape.

4.4.3.1.1 Specimen. A piece of tape, 12 inches long, from which the separator has been removed, shall be elongated to 300 + 10 percent. Then, spirally wrap the elongated tape around an AWG 8 size wire for a distance of approximately 6 inches. Except for the ends, the elongated tape shall be four layers deep. The end of the tape shall be affixed to make a lap splice with the underlying tape. The specimen so formed shall be rolled between the palms of the hands. Wear clean rubber gloves to avoid depositing corrosive acids and salts on the tape.

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4.4.3.1.2 Procedure. The specimen shall then be conditioned at a temperature of 20° to 30° C. (68° to 86° F.) for a period of 24 hours. The prepared specimen shall then be subjected to a picking action in an attempt to unwrap the splice.

4.4.3.2 Grade B tape. The fusion between layers of Grade B tape shall be determined in accordance with ASTM D119.

4.4.4 Tackiness.

4.4.4.1 Grade A tape. The tackiness of Grade A tape shall be determined by examining the specimen 10 minutes after preparation in 4.4.3.1 for any tendency to unwind from the mandrel.

4.4.4.2 Grade B tape. The tackiness of Grade B tape shall be determined in accordance with ASTM D119.

4.4.5 Dielectric strength. The dielectric strength shall be determined in accordance with ASTM D119.

4.4.6 Ozone resistance, Grade A tape.

4.4.6.1 Specimen. The specimen shall be as described in method 13021 of Federal Test Method Std. No. 601.

4.4.6.2 Procedure. Bench marks 2 inches apart shall be placed on the specimen. One end of the specimen shall be clamped in a suitable frame and the other end drawn through another clamp until the gage marks are 3 inches apart and the end of the specimen clamped. The specimen with the gage marks 3 inches apart shall be conditioned at room temperature for 30 minutes. The specimen shall be subjected to method 4111. Resistance to Ozone, Insulation and sheath, of Fed. Test Method Std. No. 228, except that the ozone concentration shall be 0.010 to 0.015 percent by volume. One specimen shall be tested from each test unit.

4.4.7 Resistance to low temperature.

4.4.7.1 Specimen. The specimen shall be a portion of the test unit 6 inches long.

4.4.7.2 Apparatus. The apparatus shall be a low temperature cabinet with suitable controls for maintaining the required temperature during the exposure period. The cabinet shall be of sufficient size and have facilities such as glass windows, handholes with insulated sleeves, etc., to permit making the test while the specimen is still in the cabinet. A thermometer or other device for measuring the temperature to within 1.0° C. (1.8° F.). A glass rod 6 inches long and 1/4 inch in diameter shall also be provided.

4.4.7.3 Procedure. The specimen and a glass rod shall be conditioned for 2 hours at a temperature of $-40 \pm 2^\circ$ C. ($-40^\circ \pm 3.6^\circ$ F.). One specimen from each test unit shall be tested. At the end of the exposure period, while still in the low temperature cabinet, the specimen shall be spirally wrapped around the glass rod. The specimen shall be examined for cracking, crazing and delaminating.

4.5 Dissipation factor, Grade A tape. The dissipation factor shall be in accordance with ASTM D150. The measurements shall be taken at a stress of 50 volts/mil with a frequency of 60 Hertz (Hz) at 130° C.

4.6 Dielectric constant, Grade A tape. The dielectric constant shall be determined as described in ASTM D150. The measurements shall be taken at a stress of 50 volts/mil with a frequency of 60 Hz at 130° C.

4.7 Effect of heat, Grade A tape.

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4.7.1 Specimen. The specimen shall be prepared as described in paragraph 4.4.3.1.1.

4.7.2 Procedure. The specimen shall be subjected to a temperature of $130^{\circ} + 1^{\circ}$ C. for a period of 500 hours.

4.8 Flexibility after heat aging, Grade A tape.

4.8.1 Specimen. The specimen shall be prepared as described in paragraph 4.4.3.1.1.

4.8.2 Procedure. The specimen shall be subjected to a temperature of $130^{\circ} + 1^{\circ}$ C. for a period of 500 hours, then cooled to room temperature. Bend it 180° around a mandrel whose diameter is equal to the diameter of the prepared specimen.

4.9 Inspection of preparation for delivery. An inspection shall be made to determine that the packaging, packing, and marking comply with the requirements in section 5 of this specification. Defects shall be scored in accordance with table I. For examination of the packaging and packing, the sample unit shall be one shipping container prepared for delivery, selected at random just prior to the closing operations. Sampling shall be in accordance with MIL-STD-105. Defects of closure listed shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 with an AQL of 4.0 defects per hundred units.

TABLE I. Classification of preparation for delivery defects

Examine	Defects
Markings (exterior and interior)	Omitted; incorrect; illegible; improper size; location; sequence or method of application.
Materials	Any component missing or damaged.
Workmanship	Inadequate application of components such as incomplete closure of container flaps, moderate stapling. Distortion of container.
Contents	Number per container is more or less than required.

5. PREPARATION FOR DELIVERY

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

5.1.1 Level A and B. Each roll of tape shall be packaged in a box conforming to PPP-B-566, or in a cellophane or plastic wrap with label visibly secured inside or outside of wrap. The box or wrap shall be secured to prevent accidental opening.

5.1.1.1 Intermediate package. Ten unit packages shall be intermediate packaged in a box conforming to PPP-B-636, class domestic, grade 125, style optional. The box shall be closed in accordance with the appendix to the box specification.

5.1.2 Level C. Tape shall be packaged in accordance with the supplier's commercial practice.

5.2 Packing.

5.2.1 Level A. Intermediate packages in quantities as specified shall be packed in a box conforming to PPP-B-636, class weather-resistant. The box shall be closed, water-proofed, and strapped in accordance with the appendix to PPP-B-636.

5.2.2 Level B. Ten intermediate packages shall be packed in a box conforming to PPP-B-636, class domestic, grade 200. The box shall be closed in accordance with the appendix to PPP-B-636.

5.2.3 Level C. The insulation tape shall be packed in such a manner to insure carrier acceptance and safe delivery at destination in compliance with the National Motor Freight Classification rules and the Uniform Freight Classification rules.

5.3 Marking. In addition to the markings required by the contract or order, the unit intermediate and shipping container shall be marked in accordance with Fed. Std. No. 123 or MIL-STD-129 as applicable.

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6. NOTES

6.1 Intended use.

6.1.1 Grade A. This grade is ozone resistant, designed primarily for splicing electrical wires and cables operating at high voltages.

6.1.2 Grade B. This grade is not ozone resistant and is used for splicing wires and cables operating at voltages of 600 volts maximum.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Type Designation No. (see 1.2).
- (c) Quantity.
- (d) Level of packaging, packing, and marking required (see 5.).
- (e) Sampling if other than specified.

6.3 Rubber insulating tape should be stored in the original boxes and preferable in a cool, dark location. The tape should not be stored in close proximity to steam pipes, radiators, or other sources of heat.

MILITARY INTEREST:

REVIEW INTEREST
Army-EL

Preparing Activity:

GSA-FSS

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-FSS, PCD
USDA-AFS
Interior-BPA
Commerce-NBS
FAA-ACO

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