

INCH-POUND  
MIL-DTL-15562G (NAVY)  
31 May 1996  
SUPERSEDING  
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7 December 1977  
(See 6.6)

DETAIL SPECIFICATION

MATTING OR SHEET, FLOOR COVERING  
INSULATING FOR HIGH VOLTAGE APPLICATION

This specification is approved for use by the Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers rubber or plastic matting and sheet floor coverings for use around electrical apparatus or circuits, as a safety measure to protect personnel from accidental exposure to electrical potentials not exceeding 3000 volts. Equipment operating at higher voltages utilize other built-in safety measures to provide personnel protection.

1.2 Classification. Material is of the following types, as specified (see 6.2).

- Type I - Sheet, smooth surface.
- Type II - Mat, runner type, smooth surface.
- Type III - Mat, runner type, raised diamond pattern surface.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, SEA 03R42, Naval Sea Systems Command, 2531 Jefferson Davis Hwy, Arlington, VA 22242-5160 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

FSC 7220

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

FEDERAL

- FED-STD-501 - Floor Coverings, Resilient, Nontextile: Sampling and Testing.
- FED-STD-595 - Colors Used in Government Procurement.
- FED-STD-601 - Rubber: Sampling and Testing.

MILITARY

- MIL-STD-407 - Visual Inspection Guide for Rubber Molded Items.
- MIL-STD-1623 - Fire Performance Requirements and Approved Specifications for Interior Finish Materials and Furnishings (Naval Shipboard Use).

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension. (DoD adopted)
- D 1204 - Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
- D 1242 - Standard Test Methods for Resistance of Plastic Materials to Abrasion. (DoD adopted)

ASTM'S (Continued)

D 2240 - Standard Test Method for Rubber Property - Durometer Hardness.

D 2457 - Standard Test Method for Specular Gloss of Plastic Films and Solid Plastics.

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

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Material. The floor covering material shall be made from a compound utilizing synthetic rubber, reclaimed rubber, polyvinyl chloride, a copolymer of polyvinyl chloride and polyvinyl acetate, or a combination thereof. The use of ingredients which would tend to emit objectionable odors in service are prohibited. Reclaimed rubber shall be used to the maximum extent possible. The material shall be free of asbestos.

3.3 Construction.

3.3.1 Types I and II. Types I and II floor covering material shall have a smooth wearing surface, free from blisters, cracks, protruding particles, and embedded foreign matter. The color, finish, and wearing surface shall be uniform throughout the full thickness of the flooring material or when the top wear surface is calendered to the base sheet (laminated construction), the wear surface shall show evidence of marbleizing dispersed throughout the full thickness of the wear surface. If a protective top layer is incorporated into the construction, the color, mottling, marbleizing, or a combination of both mottling and marbleizing shall be evident. This layer shall conform to material requirements (see 3.2) and shall be 0.015-inch thick maximum. The back side of the floor covering shall be sanded, roughened, knurled, or finished with a cloth fabric or cloth imprint.

3.3.2 Type III. The type III mat shall have raised diamond-shaped figures as shown on figure 1. The back side shall be finished with a cloth imprint.

3.4 Thickness.

3.4.1 Types I and II. The thickness of types I and II material shall be 0.125-inch minimum. The wear surface, if calendered to a base sheet, shall be 0.040-inch thick minimum.

3.4.2 Type III. The overall thickness of type III material shall be 0.187-inch minimum.

3.5 Size. Unless otherwise specified (see 6.2), the length of the rolls shall be 25 yards with a maximum tolerance of plus or minus 3.0 yards. Two pieces are permitted in a single roll, the smallest piece being not less than 5 yards long. The two piece requirement is restricted to no more than 50 percent of each lot. Unless otherwise specified (see 6.2), type I sheeting shall be available in 36- and 72-inch widths with zero minus tolerance. Unless otherwise specified (see 6.2), types II and III matting shall be available in a 36-inch width with zero minus tolerance with finished, straight edges.

3.6 Color.

3.6.1 Type I. The color, finish, wearing surface, and mottling, marbleizing, or a combination of both mottling and marbleizing shall match a sample agreed upon by buyer and seller. In mottled or marbleized flooring, the mottling or marbleization shall be worked throughout the full thickness of the material or the wear surface, and shall be evident through any protective top layer incorporated into the construction (see 3.3.1). The marbleized or mottled top surface appearance may differ from the back surface appearance.

3.6.2 Types II and III. The basic or background (if mottled or marbleized pattern) color shall correspond to blue, No. 25177, gray, No. 26231, or green, No. 14223 of FED-STD-595 or as specified (see 6.2). A solid, marbleized, or mottled pattern shall match a sample as agreed upon by buyer and seller.

3.7 Tensile strength.

3.7.1 As-received condition (initial). The tensile strength of the floor covering in the as-received condition shall be not less than 800 pounds per square inch (lb/in<sup>2</sup>) when tested as specified (see 4.6.1).

3.7.2 After immersion in sulfuric acid. The floor covering, after being subjected to the immersion test specified (see 4.6.2), shall have a tensile strength of at least 70 percent of the initial tensile strength.

3.7.3 After oxygen bomb aging. The floor covering, after being subjected to the test specified (see 4.6.3), shall have a tensile strength of at least 80 percent of the initial tensile strength.

3.7.4 After light aging. The floor covering, after being subjected to the light aging test specified (see 4.6.4), shall have a tensile strength of at least 65 percent of the initial tensile strength.

3.8 Ultimate elongation. The ultimate elongation for type I shall be not less than 75 percent, and for type II and type III not less than 100 percent, when tested as specified (see 4.6.5).

3.9 Permanent set. The permanent set shall be not greater than 25 percent when tested as specified (see 4.6.6).

3.10 Hardness. The material, when tested as specified (see 4.6.7), shall have a Shore A durometer hardness of  $95 \pm 5$  for type I, 75 minimum for type II, and 65 minimum for type III.

3.11 Abrasion resistance. The thickness loss of three samples, averaged, shall not exceed 10 mils for type I and 20 mils for type II, when tested as specified (see 4.6.8). There is no requirement for type III.

3.12 Flexibility. The floor covering shall not crack or show any indication of weakness when tested as specified (see 4.6.9).

3.13 Voltage. The floor covering shall not puncture, become appreciably warm at any spot, or show any other sign of weakness when tested as specified (see 4.6.10).

3.14 Dielectric strength. The floor covering shall not fail at less than 30,000 volts when tested as specified (see 4.6.11).

3.15 Fire resistance. The floor covering shall conform to the requirements as set forth in MIL-STD-1623 (see 4.6.12).

3.16 Dimensional stability. The floor covering shall not change in linear dimensions more than plus or minus 0.020 inch per linear foot for type I and plus or minus 0.250 inch per linear foot for types II and III (see 4.6.13).

3.17 Identification marking. The floor covering shall be permanently and legibly marked on the backside (underside), with the name of the manufacturer or his registered trademark, specification number, and month and year of manufacture. Marking shall be repeated at least once every 6 feet.

3.18 Gloss. The top surface gloss for type I flooring when tested as specified (see 4.6.14) shall demonstrate a specular gloss level of 50 minimum.

3.19 Workmanship. The occurrence of defects shall not exceed the applicable quality levels when visually and dimensionally examined as specified (see 4.3.5.1). The floor covering shall have a smooth wearing surface, free from blisters, cracks, protruding particles, and embedded foreign matter.

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (see 4.2).
- (b) Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall consist of the examination and tests specified in table I.

TABLE I. First article inspection.

Property	Test requirements			Applicable requirement	Test method
	Type I	Type II	Type III		
Thickness, inch, minimum	0.125	0.125	0.187	3.4	4.3.5
Color	-----	-----	-----	3.6	4.3.5
Tensile strength, lb/in <sup>2</sup>					
Initial	800	800	800	3.7.1	4.6.2
After immersion, sulfuric acid	70 percent of initial	70 percent of initial	70 percent of initial	3.7.2	4.6.2
After oxygen bomb aging	80 percent of initial	80 percent of initial	80 percent of initial	3.7.3	4.6.3
After light aging	65 percent of initial	65 percent of initial	65 percent of initial	3.7.4	4.6.4
Ultimate elongation, percent min.	75	100	100	3.8	4.6.5
Permanent set, percent max.	25	25	25	3.9	4.6.6
Hardness	95±5	75 min.	65 min.	3.10	4.6.7
Abrasion resistance, mils loss, max.	10	20	-----	3.11	4.6.8
Flexibility	shall pass	shall pass	shall pass	3.12	4.6.9
Voltage	shall pass	shall pass	shall pass	3.13	4.6.10
Dielectric strength, volts, min.	30,000	30,000	30,000	3.14	4.6.11
Fire resistance	shall pass	shall pass	shall pass	3.15	4.6.12
Dimensional stability, inch/foot	± 0.020	± 0.250	± 0.250	3.16	4.6.13
Identification marking	-----	-----	-----	3.17	4.3.5
Gloss	50	-----	-----	3.18	4.6.14

4.3 Conformance inspection. Conformance inspection shall be as specified in table I and 4.3.1 through 4.3.3.

4.3.1 Lot. For the purpose of conformance inspection and test sampling, a lot is defined as all the deck covering of the same type, from a single, uniform batch, produced and offered for delivery at one time. The addition or removal of any substance to a batch shall constitute a new lot.

4.3.2 Sampling for conformance inspection. As a minimum, the contractor shall select a sample from each lot of completed deck covering as specified in 4.3.2.1, and examine them as specified in table I (see 6.4.1).

4.3.2.1 Sampling for matting or sheeting examinations. A random sample of rolls of material shall be selected as specified in table II. Sampling plan "A" shall be used for all tests except for the voltage test, which shall have samples selected in accordance with sampling plan "B". For sampling plan "A", if the lot size is less than five rolls, the sample shall include the entire lot.

TABLE II. Sampling plan.

Lot or batch size	Sampling plan A	Sampling plan B
	Sample size	Sample size
1 to 8	5	All
9 to 50	5	13
51 to 90	7	13
91 to 150	11	13
151 to 280	13	20
281 to 500	16	29
501 to 1200	19	34
1201 to 3200	23	42
3201 to 10,000	29	50

4.3.3 Sampling for conformance tests. For the tests specified in 4.4 and 4.5, except for voltage, four rolls shall be selected from the sample selected as specified in 4.3.2.1, and a piece of sufficient size for testing shall be taken from each of these four rolls. If the lot contains less than four rolls, each roll shall be sampled. For the voltage test, the entire area of each sample roll selected in 4.3.2.1 shall be tested as described (see 4.6.10).

4.3.4 Sampling for production check tests. With the first lot of material offered for delivery under a contract and, normally, once thereafter for every 10 lots which have passed conformance inspection, sufficient material shall be taken from each of the sample rolls selected as specified (see 4.3.3) for the production check tests specified (see 4.5).

4.3.5 Visual and dimensional examination.

4.3.5.1 Flooring material. Each of the sample rolls of the sheet or matting selected as specified in 4.3.2.1 shall be visually and dimensionally examined to verify compliance with 3.4, 3.5, 3.6, 3.17, and 3.18. The surfaces shall be examined for the visual defects described in MIL-STD-407 to determine conformance to 3.17 (see 6.4.2).

4.4 Conformance tests. Each of the samples selected as specified in 4.3.3 shall be subjected to the following tests:

<u>Test</u>	<u>Paragraph</u>
Tensile strength (initial only)	4.6.1
Ultimate elongation	4.6.5
Hardness	4.6.7
Flexibility	4.6.9
Voltage	4.6.10
Dielectric strength	4.6.11
Fire resistance	4.6.12
Dimensional stability	4.6.13
Gloss	4.6.14

4.5 Production check tests. Each of the samples selected as specified in 4.3.4 shall be subjected to the following tests (see 6.4.1):

<u>Test</u>	<u>Paragraph</u>
Tensile strength	
After immersion	4.6.2
After oxygen bomb aging	4.6.3
After light aging	4.6.4
Permanent set	4.6.6
Abrasion resistance	4.6.8

4.6 Test methods. Unless otherwise specified (see 6.2), all specimens shall be conditioned for at least 16 hours at  $27 \pm 4$  degrees Celsius ( $^{\circ}\text{C}$ ) before being tested and the tests shall be performed within this temperature range.

4.6.1 Tensile strength. Tensile strength shall be determined in accordance with ASTM D 412 using die C for preparing dumbbell specimens.

4.6.2 Immersion test. Three dumbbell rubber specimens of the size specified (see 4.6.1) shall be used. Both sides of the specimen shall be buffed. The specimens shall be immersed and tested for tensile strength in accordance with method 6121 of FED-STD-601. The immersion medium shall be a 20 percent by weight sulfuric acid solution and the immersion temperature shall be  $70 \pm 1^{\circ}\text{C}$ . After immersion, the specimens shall be removed, rinsed lightly with water at room temperature, and blotted lightly with filter paper. The specimens shall then be suspended or placed on a screen and allowed to dry at room temperature in air protected from drafts for 2 hours, after which the tensile strength shall be determined. In calculations of the tensile strength, measurements for cross-sectional area shall be taken after immersion and drying of the specimens.

4.6.3 Oxygen bomb aging test. Three dumbbell rubber test specimens of size specified (see 4.6.1) shall be subjected to the oxygen bomb aging test in accordance with method 7111 of FED-STD-601 and then tested for tensile strength. The aging period shall be for  $46 \pm 1/4$  hours.

4.6.4 Light aging. Three dumbbell rubber test specimens of the size specified (see 4.6.1) shall be subjected to light aging in accordance with method 7311 of FED-STD-601 and then tested for tensile strength. The aging method, however, should be modified as follows:

Exposure for 25 hours shall be made at 10 percent elongation, using "Ever-Ready Sunshine" carbons or equal or other method satisfactory to the contracting activity. Total dosage in decomposition of oxalic acid by uranyl oxylate actinometer shall be a minimum of  $0.5 \times 10^4$  milligrams (mg) per square decimeter.



4.6.5 Ultimate elongation. Ultimate elongation shall be determined in accordance with ASTM D 412, using die C for preparing dumbbell specimens. Specimen thickness shall be as specified (see 3.4).

4.6.6 Permanent set. Permanent set shall be determined in accordance with ASTM D 412. The specimens shall be elongated 75 percent for type I, and 100 percent for types II and III in the test. Specimen thickness shall be as specified (see 3.4).

4.6.7 Hardness. Hardness shall be determined in accordance with ASTM D 2440, Shore A durometer.

4.6.8 Abrasion resistance. The abrasion resistance shall be determined in accordance with ASTM D 1242, method A (loose abrasive), except that thickness loss in mils will be reported in lieu of volume loss.

4.6.9 Flexibility. The material shall be tested as described in method 3111 of FED-STD 501. The mandrel diameter shall be 0.75-inch normal.

4.6.10 Voltage. The voltage test shall be made on the entire area of every roll of material offered for test except for the peripheral area within 2 inches of the edge. The material shall be tested between electrodes consisting of rectangular metal sheets, having smoothly rounded edges and corners and of any convenient length. The width shall be such that arcing around the edges of the material will not occur. The tests shall be made progressively until the entire test area of the material (the entire roll) has been covered, 15,000 volts alternating current (ac) being applied for 1 minute at each position of the electrodes. The contact pressure of the electrodes shall be adequate to obtain good electrode contact with the test specimen.

4.6.11 Dielectric strength. Specimens shall be tested to failure in air between 2-inch disk electrodes with edges rounded to a radius of 1/4 inch. The voltage shall be applied at the rate specified (see 4.6.11.1.4). The test specimen shall be a minimum of 1 square foot in area and there shall be a minimum of five measurements made with no two measurements being less than 4 inches apart.

4.6.11.1 Test voltage.

4.6.11.1.1 Source. The test voltage shall be obtained from test equipment, all parts having a capacity of not less than 1/2 kilovoltampere (kVA) per square foot of electrode surface. In no case shall the rating of any part of the test apparatus be less than 5 kVA. The frequency of the test voltage shall not exceed 65 hertz (Hz).

4.6.11.1.2 Regulation. The method of regulating the test voltage shall be one which does not distort the waveform of the test voltage from a sine wave. Acceptable methods include:

- (a) Field regulation of the alternator supplying the transformer.
- (b) Induction type regulator.
- (c) Variable-ratio-transformer type of regulator.
- (d) Potentiometer type of rheostatic control where the current in the portion of the potentiometer resistance in parallel with the primary transformer is at least five times the exciting current of the transformer.

4.6.11.1.3 Measurement. The test voltage shall be measured by one of the following methods:

- (a) A properly calibrated, electrostatic voltmeter connected directly across the specimen under test.
- (b) Any properly calibrated, commercial type of alternating current voltmeter connected to the low-tension side of the transformer in conjunction with the ratio of transformation of the transformer, provided that the ratio is definitely known for all test conditions.

4.6.11.1.4 Application. The potential shall be applied at a low value and gradually and steadily raised at the rate of 800 to 1,000 volts per second until the prescribed testing voltage is reached.

4.6.12 Fire resistance. The material shall be tested in accordance with MIL-STD-1623.

4.6.13 Dimensional stability. Stability shall be determined in accordance with ASTM D 1204. Samples shall be heated to a test temperature of  $70 \pm 0.5^\circ\text{C}$  for  $2 \pm 1/4$  hours.

4.6.14 Gloss. The top surface gloss for type I flooring shall be determined in accordance with ASTM D 2457. The measurements shall be taken utilizing a 60 degree gloss angle.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The mat and sheet flooring is intended to protect personnel against accidental exposure to electrical potentials not exceeding 3000 volts. The sheet material, type I, is intended for use as a permanent installation, that is, cemented over the entire exposed floor. The runner matting, types II and III, is designed for use as a portable mat and normally used in single strips in front of electrical work benches, switchboards, or panels.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- (d) When a first article is required (see 3.1).
- (e) When length and width is other than as specified (see 3.5).
- (f) Color required (see 3.6.2).
- (g) Conditioning of specimens if other than as specified (see 4.6).
- (h) Levels of packaging (see 5.1).
- (i) Special marking, if required (see 5.1).

6.3 First article. When a first article inspection is required, the items should be a first article sample. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Lot rejection criteria.

6.4.1 Conformance inspection. If one or more defects are found in any sample, the entire lot should be rejected. The contractor has the option of screening 100 percent of the lot for the defective characteristic(s) or providing a new lot to be inspected in accordance with the sampling plans contained herein. The contractor should maintain for a period of three years after contract completion records of inspections, tests, and any resulting rejections.

6.4.2 Flooring material visual and dimensional examination. Any roll in the sample containing one or more visual or dimensional defects is cause for rejection of the lot represented by that sample.

6.5 Subject term (key word) listing.

Dielectric strength  
Electrical potential  
Electrical safety

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Review activities:

Navy - YD1, OS, MC, CG, AS

Preparing activity:

Navy - SH  
(Project 7220-N254)