

INCH-POUND
MIL-C-882E
27 January 1989
SUPERSEDING
MIL-C-882D
22 October 1982
(See 6.4)

MILITARY SPECIFICATION

CLOTH, DUCK, COTTON OR COTTON-POLYESTER BLEND, SYNTHETIC RUBBER,
IMPREGNATED, AND LAMINATED, OIL RESISTANT

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

1. SCOPE

1.1 Scope. This specification covers laminated cotton duck or cotton-polyester blend duck cloth that has been impregnated with oil resistant synthetic rubber.

1.2 Classification. Cloth shall be of the following types as specified (see 6.2).

Type I - Sheets
Type II - Strips
Type III - Cut items
Type IV - Molded items

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form 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).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS

FEDERAL

- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

MILITARY

- MIL-F-16884 - Fuel, Naval Distillate.
- MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.

STANDARDS

FEDERAL

- FED-STD-191 - Textile Test Methods.
- FED-STD-601 - Rubber: Sampling and Testing.

MILITARY

- MIL-STD-289 - Visual Inspection Guide for Rubber Sheet Material.
- MIL-STD-407 - Visual Inspection Guide for Rubber Molded Items.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Waterproofing; with Appropriate Test Methods.
- MIL-STD-2073-1 - DoD Materiel Procedures for Development and Application of Packaging Requirements.

(Unless otherwise indicated, copies of federal and military specifications and standards are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 Non-Government publications. The following documents 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 792 - Standard Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement.
(DoD adopted)
- D 3951 - Standard Practice for Commercial Packaging.
(DoD adopted)

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 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 Materials.

3.1.1 Duck. The duck shall be of highest quality cotton or cotton-polyester 50-50 blend, and shall weigh a minimum of 8 ounces per square yard. The cotton warp and the filling yarn shall be 2-ply. The cotton-polyester warp and fill shall be single yarn, with a minimum breaking strength, as determined by the grab method, of 150 pounds per inch per width (piw) warp, and 140 piw fill. The filling count of the duck shall be 40 ± 2 threads per inch and the warp count shall be 50 ± 1 threads per inch.

3.1.2 Synthetic rubber. The synthetic rubber used for impregnating the cotton or cotton-polyester blend duck material shall be a compound which shall conform to the requirements of this specification.

3.1.3 Recovered materials. Unless otherwise specified herein, all material incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials.

3.2 Configuration. Dimensions and shapes for types I through IV shall be as specified (see 6.2).

3.2.1 Tolerances. Tolerances shall be as specified in each contract other than for type II (see table I and 6.2).

TABLE I. Tolerances.

Thickness (All types) (inch)	Type II	
	Width (inches)	Tolerances (\pm inches)
± 0.031	1/4 to 1/2 inclusive	1/32
	over 1/2 to 1 inclusive	3/64
	over 1	1/16

3.3 Age. The age of the impregnated cotton or cotton-polyester blend duck based on the month in which it is cured shall not exceed 12 months at the time of acceptance under contract by the purchaser. Material shall be rejected when the cure date cannot be determined.

3.4 Physical requirements. The laminated material shall conform to the following physical requirements:

3.4.1 Density. The density shall be a minimum of 67 pounds per cubic foot (lb/ft^3) (see 4.4.2).

3.4.2 Load deflection. The material shall be within the deflection limits shown in table II (see 4.4.3).

TABLE II. Load deflection.

Load lb/in ²	Deflections of laminated material											
	14/64 - 16/64 inch thick		17/64 - 19/64 inch thick		21/64 - 23/64 inch thick		15/32 - 17/32 inch thick		19/32 - 21/32 inch thick		61/64 - 67/64 inch thick	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
52	0.001	0.005	0.002	0.005	0.002	0.007	0.003	0.009	0.004	0.011	0.006	0.019
100	.002	.007	.003	.009	.004	.011	.005	.014	.007	.017	.010	.028
200	.003	.011	.006	.013	.007	.016	.009	.021	.013	.027	.018	.043
300	.005	.014	.008	.017	.010	.020	.013	.027	.018	.034	.025	.054
400	.006	.016	.010	.020	.012	.024	.016	.033	.022	.040	.031	.064
500	.008	.018	.012	.023	.014	.027	.019	.038	.026	.046	.037	.073
600	.009	.020	.013	.025	.016	.030	.022	.042	.029	.052	.043	.081
700	.010	.022	.015	.027	.018	.033	.025	.047	.033	.056	.049	.090
800	.012	.024	.017	.029	.019	.035	.028	.051	.036	.062	.055	.098
900	.013	.025	.018	.031	.021	.038	.031	.055	.040	.066	.060	.105
1,000	.014	.027	.020	.033	.023	.040	.034	.058	.043	.070	.065	.111
1,200	.017	.030	.023	.037	.026	.044	.040	.065	.049	.078	.075	.124
1,400	.019	.033	.025	.040	.029	.048	.045	.072	.055	.086	.085	.136
1,600	.021	.035	.028	.043	.032	.052	.050	.078	.061	.093	.094	.147
1,800	.024	.038	.031	.046	.035	.055	.055	.084	.067	.100	.103	.157
2,000	.026	.040	.033	.049	.038	.058	.060	.090	.072	.107	.112	.168

3.4.3 Permanent set. The permanent set of the laminated material shall not be more than the values shown in table III (see 4.4.4).

TABLE III. Permanent set.

Compressive stress (lb/in ²)	Permanent set
500	3.0
1,000	4.0
3,000	7.0
5,000	10.0
10,000	13.0

3.4.4 Laminated material oil resistance.

3.4.4.1 Delamination. The laminated material shall show no delamination (see 4.4.5.1).

3.4.4.2 Swell. The volume swell shall be not more than 25 percent (see 4.4.5.2).

3.5 Fungus resistance. Fungus growth shall not be apparent (see 4.4.6).

3.6 Workmanship. The finished material shall be clean and evenly laminated. The occurrence of defects shall not exceed the acceptance number specified.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Sampling for quality conformance inspection.

4.2.1 Lot. For purposes of quality conformance inspection, a lot shall consist of not more than 2,500 pounds of material of the same form and dimensions, produced in one plant under essentially the same conditions and offered for delivery at one time.

4.2.1.1 Cut and molded items. The lot size shall be the number of cut or molded items in the lot.

4.2.1.2 Sheets and strips. The lot size shall be the number of unit areas in all sheets or strips of the lot. A unit area is defined as an area of 1 square foot; thus a sheet 2 feet wide and 20 feet long would be 40 units, and a strip 4 inches wide by 20 feet long would be 7 units.

4.2.2 Sampling for examination. The sample size (number of samples to be selected from a lot and examined as specified in 4.3.1) shall be as specified in table IV.

TABLE IV. Sampling for examination.

Lot size, number of cut or molded items, or unit areas of sheets or strips	Sample size, number of cut or molded items, or unit areas of sheets or strips	Number of nonconforming or defective pieces or unit areas			
		Major defects		Total defects	
		accept	reject	accept	reject
Up to 8	5	0	1	0	1
9 to 15	7	0	1	0	1
16 to 25	10	0	1	1	2
26 to 40	15	0	1	1	2
41 to 65	15	1	2	2	3
66 to 110	20	1	2	2	3
111 to 180	25	1	2	3	4
181 to 500	35	2	3	5	6
501 to 800	50	3	4	6	7
801 to 1800	75	4	5	9	10
1801 to 3200	110	6	7	12	13
3201 and Up	150	8	9	17	18

4.2.2.1 Specified samples. The specified samples shall be selected at random from the lot. The sampling of the sheet and strip material shall be divided among all rolls in the lot.

4.2.2.2 Special sample. With each lot, 1 foot of the cotton or cotton-polyester blend duck, the full width of the bolt, of the same material used in the manufacture of the lot, shall be furnished.

4.2.3 Sampling for tests. Two sets of samples shall be taken from each lot in sufficient quantity to perform all tests specified in 4.3.2. The samples shall be taken from those selected in accordance with 4.2.2. No two samples shall be taken from the same sheet, strip, cut or molded item. Where test

specimens cannot be prepared from the items, the contractor shall furnish two samples each 6 by 6 by 0.5 inches thick. These pieces must be identical in composition and equivalent in cure, and prepared from material used in the lot of finished material offered for delivery.

4.3 Quality conformance inspection.

4.3.1 Visual and dimensional examination. Each of the sample pieces taken in accordance with 4.2.2 shall be subjected to surface examination for number of plies, workmanship, dimensions, and tolerances. MIL-STD-289 or MIL-STD-407 shall be used to determine and evaluate defects through visual examination. In addition, the samples shall be examined for tackiness and brittleness. Any sample sheet, strip, cut, or molded part found not to be in accordance with this specification shall not be offered for delivery. If the number of nonconforming items exceeds the acceptance number specified in 4.2.2 for that sample, this shall be cause for rejection of the lot represented by the sample.

4.3.2 Quality conformance tests. Each set of samples selected in accordance with 4.2.3 shall be subjected to the tests specified in 4.4.2 through 4.4.6. If any sample fails to conform to this specification, this sample shall be cause for rejection of the entire lot represented by the sample.

4.3.2.1 Special sample. The sample piece of duck furnished in accordance with 4.2.2.2 shall be subjected to the tests specified in 4.4.1.

4.4 Test procedures. Unless otherwise specified in the test method, tests shall not be conducted prior to a conditioning period of the test specimen of 4 hours at room temperature 27 ± 5 degrees Celsius ($^{\circ}\text{C}$). Sample preparation may be undertaken without regard to this time interval.

4.4.1 Count and weight. Thread count and weight of duck shall be determined in accordance with methods 5050 and 5041 respectively of FED-STD-191.

4.4.2 Density. The specific gravity shall be determined by the standard hydrostatic displacement method of ASTM D 792. Density in pounds per cubic foot equals specific gravity (s.g.) times 0.03613 times 1728 ($\text{lb}/\text{ft}^3 = \text{s.g.} \times 0.03613 \times 1728$).

4.4.3 Load deflection. The load deflection shall be determined as follows:

- (a) Each specimen of impregnated cotton or cotton-polyester blend duck, 2 by 2 inches by the thickness of the material, shall be compressed, perpendicular to the direction of lamination, between two steel plates which are held rigidly parallel. The origin of deflection measurements shall be taken at a stress of 5 pounds per square inch (lb/in^2) on the specimen.
- (b) The load shall be increased at the rate of 500 pounds per minute and the deflection recorded at the specified load (see 3.4.2). The average material deflection of two specimens shall be reported as the deflection at each specified load.

4.4.4 Permanent set. The permanent set shall be determined as follows:

- (a) The specimen of impregnated cotton or cotton-polyester blend duck, 2 by 2 inches by the thickness of the material, shall be compressed, perpendicular to the direction of lamination, between two steel plates under a preliminary load of 50 lb/in² for 5 minutes. This shall be considered the zero point.
- (b) The load shall then be increased at the rate of 500 pounds per minute up to 500 lb/in². The total load shall then be released. The loss in thickness shall be measured between 30 seconds and 1 minute after the load is removed and expressed as a percentage of the original "zero point" thickness. The next higher specified load shall then be applied to the same specimen within 5 minutes of release except that no precondition load shall be applied. The loss in height shall again be determined as a percentage of the original "zero point" thickness. This loading and unloading shall be repeated on the same specimens in duplicate to cover the range of permanent set determinations specified in 3.4.3. The average value of the two determinations shall be reported as the permanent set after the specified loads.

4.4.5 Laminated material oil resistance.

4.4.5.1 Delamination. The delamination test shall be in accordance with method 6311 of FED-STD-601; except that diesel oil in accordance with MIL-F-16884 shall be used as the immersion medium.

4.4.5.2 Volume swell. The volume swell test shall be in accordance with method 6211 of FED-STD-601, except that the immersion period shall be 24 ± 1/4 hours. The immersion medium shall be diesel oil in accordance with MIL-F-16884.

4.4.6 Fungus resistance. Fungus resistance shall be determined by the qualitative procedure of method 5750 of FED-STD-191, except the number of specimens shall be two. The specimens shall be cut from the finished material and shall be the thickness of the material in the lot. Prior to inoculation, the specimen shall be heated at 149 ± 2.2°C for 1 hour and then cooled to room temperature.

4.5 Packaging inspection. An examination shall be made in accordance with table V, to determine that preservation, packing, contents, and markings for shipment, stowage, and storage comply with the requirements of this specification. The sample unit shall be one shipping container, fully packed, selected just prior to the closing operation. Shipping containers fully prepared for delivery shall be examined for closure defects. Sampling requirements shall be the same as specified for material in 4.2.2, but shall apply to unit containers and not the impregnated cotton or cotton-polyester blend duck.

TABLE V. Packaging inspection.

Examine	Defect
Packaging	Unit package not packaged as specified, not level specified. Packaging material not as specified. Closure not as specified.
Packing	Not in accordance with contract requirements. Container not as specified; closure not accompanied by specified or required methods or materials. Any nonconforming component, component missing, damaged or otherwise defective affecting serviceability. Inadequate application of components such as: incomplete closure and case liners, container flaps loose or inadequate strappings: bulged or distorted containers.
Count	Number of sheets per container less than specified or indicated quantity.
Weight	Gross weight exceeds specified requirements.
Markings	Interior or exterior markings (as applicable) omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

4.5.1 Rejected lots. A unit container found with a defect shall not be offered for delivery and if the number of defective units exceeds the acceptance number shown in table IV, this shall be cause for rejection of the entire lot represented by the units.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 General.

5.1.1 Navy fire-retardant requirements.

5.1.1.1 Lumber and plywood. When specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container and pallet construction members, blocking, bracing and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

- Levels A and B - Type II - weather resistant.
- Category 1 - general use.
- Level C - Type I - non-weather resistant.
- Category 1 - general use.

5.1.1.2 Fiberboard. When specified (see 6.2), fiberboard used in the construction of class domestic, non-weather resistant fiberboard, and cleated fiberboard boxes, including interior packaging forms shall meet the requirements of PPP-F-320 and amendments thereto.

5.2 Preservation. Preservation shall be level A or commercial as specified (see 6.2).

5.2.1 Level A. The laminated material shall be preserved as follows:

5.2.1.1 Type I. Unless otherwise specified (see 6.2), sheets shall be preserved as flat slabs not over 7 feet long and shall be sealed in seamless, minimum 4 mil thick polyethylene tubing. The polyethylene shall be heat sealed preferably, but may be twisted and tied with plastic if desired.

5.2.1.2 Type II. Strips shall be individually coiled and sealed in polyethylene as specified in 5.2.1.1.

5.2.1.3 Types III and IV. Cut or molded items shall be bulk bagged in polyethylene as specified in 5.2.1.1.

5.2.1.4 Intermediate containers. Intermediate containers shall conform to style RSC, type CF of PPP-B-636 for types II, III and IV. Box closure shall conform to the applicable box specifications or the appendices thereto. The gross weight shall not exceed 50 pounds.

5.2.2 Commercial. The laminated material shall be preserved in accordance with ASTM D 3951.

5.3 Packing. Packing, when required (see 6.2), shall be level A, B, or commercial as specified (see 6.2).

5.3.1 General requirements for levels A and B. Containers selected (see 5.3.2) shall be of minimum weight and cube consistent with the protection required, of uniform size, and contain identical quantities.

5.3.2 Levels A and B containers. The laminated material, preserved as specified (see 5.2), shall be packed in exterior shipping containers in accordance with appendix C, table VII of MIL-STD-2073-1, for the level of packing specified (see 5.3). Unless otherwise specified (see 6.2), container selection including container options shall be the contractor's option.

5.3.2.1 Waterproofing. Unless otherwise specified (see 6.2), level A and, when specified (see 6.2), level B shipping containers shall be provided with caseliners, linings, wraps or shrouds in accordance with the waterproofing requirements of MIL-STD-1186.

5.3.2.2 Closure and gross weight.

5.3.2.2.1 Closure. Container closure, reinforcing, or banding shall be in accordance with the applicable container specification or appendix thereto except that weather-resistant fiberboard boxes shall be closed in accordance with

method V and reinforced with non-metallic or tape banding and domestic non-weather-resistant fiberboard boxes shall be closed in accordance with method I using pressure sensitive tape.

5.3.2.2.2 Weight. Wood, plywood, and cleated type containers exceeding 200 pounds gross weight shall be modified by the addition of skids in accordance with MIL-STD-2073-1 and the applicable container specification or appendix thereto.

5.3.3 Commercial. Mounts, preserved as specified (see 5.2), shall be packed for shipment in accordance with ASTM D 3951 and herein.

5.3.3.1 Container modification. Shipping containers exceeding 200 pounds gross weight shall be provided with a minimum of two, 3- by 4-inch nominal wood skids laid flat, or a skid- or sill-type base which will support the material and facilitate handling by mechanical handling equipment during shipment, stowage and storage.

5.4 Palletized unit loads. When specified (see 6.2), containers shall be palletized in accordance with appendix F of MIL-STD-2073-1.

5.5 Marking

5.5.1 Levels A, B, and commercial. In addition to any special marking required (see 6.2), interior (unit) packs, intermediate and shipping containers and palletized unit loads shall be marked for shipment, stowage, and storage in accordance with appendix F of MIL-STD-2073-1 and shall include bar coding.

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 laminated cotton or cotton-polyester blend duck covered by this specification is intended for use in vibration attenuation and shock damping.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (c) Type material required (see 1.2).
- (d) Dimensions, tolerances, and shape, as applicable, of types I through IV material (see 3.2 and 3.2.1).
- (e) When fire-retardant materials are required (see 5.1.1.1).
- (f) Levels of preservation and marking (see 5.2 and 5.5.1).
- (g) When required, level of packing (see 5.3).
- (h) Container required (see 5.3.2).
- (i) Whether waterproofing is required (see 5.3.2.1).
- (j) Whether palletization is required (see 5.4).

6.3 Subject term (key word) listing.

Density
Fungus resistant
Permanent set
Warp and filling

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

Custodians:

Army - GL
Navy - SH
Air Force - 99

Preparing activity:

Navy - SH
(Project 8305-0233)

Review activities:

Army - MI, MR
DLA - CT

User activities:

Army - ME
Navy - AS

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER
MIL-C-882E(SH)

2. DOCUMENT TITLE CLOTH, DUCK, COTTON OR COTTON POLYESTER BLEND, SYN-
THETIC RUBBER, IMPREGNATED, AND LAMINATED, OIL RESISTANT

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

VENDOR

USER

MANUFACTURER

OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)