MIL-L-45973A
8 January 1976
SUPERSEDING
MIL-L-45973(WC)
17 June 1975

MILITARY SPECIFICATION

# LINER MATERIAL, GREASEPROOF

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

## 1. SCOPE

1.1 Scope. This specification covers the requirements for greaseproof liner material intended for use as the first inner ply of spirally wound composite containers.

1.2 CLASSIFICATION

1.2.1 Types. Greaseproof liner material shall be of the following types, as specified:

Type I - Kraft-film laminate (see 6.5)
Type II - Vegetable parchment (see 6.6)

## 2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

| | | |
|---|---|---|
| UU-P-31 | - | Paper, General Specifications and Methods of Testing |
| MMM-A-260 | - | Adhesive, Water-Resistant (for Sealing Waterproofed Paper) |
| PPP-B-1055 | - | Barrier Material, Waterproofed, Flexible |

Military

| | | |
|---|---|---|
| MIL-B-121 | - | Barrier Material, Greaseproofed, Flexible (Waterproofed) |
| MIL-G-3278 | - | Grease, Aircraft and Instrument (for Low and High Temperature) |

MIL-I-45607 - Inspection Equipment Acquisition, Maintenance and Disposition of

STANDARDS

Federal

Fed. Std. No. 356 - Commercial Packaging of Supplies and Equipment

Military

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-109 - Quality Assurance Terms and Definitions

MIL-STD-129 - Marking for Shipment and Storage

MIL-STD-147 - Palletized Unit Loads for 40" X 48" Pallets

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

3. REQUIREMENTS

3.1 Materials, construction and design. Greaseproof liner material shall conform to the material, construction and design requirements specified herein.

3.1.1 Material. Liner material shall be made from such materials to insure compliance with this specification.

3.1.2 Construction. Liner material shall be constructed of one or more plies in a manner to insure compliance with this specification. Coatings or laminations shall be uniform in application or structure.

3.1.3 Design. Liner material shall be furnished in rolls. Unless otherwise specified (see 6.2), rolls shall be at least 100 yards in length or multiples thereof and 36 inches + 1/8 inch in width. Rolls shall be uniformly and smoothly wound on nonreturnable fiber cores having a minimum inside diameter of 3 inches with a + 1/16 inch tolerance. The core length shall not be less than the specified roll width nor greater by more than 1/2 inch at each end. No roll shall contain more than 2-splices (3 pieces). Splices shall be even, neat, cover the entire width of the roll and shall not separate during unwinding of the roll. Splices shall be indicated on both sides of the roll. Rolls shall be restrained from unwinding.

3.1.4 Grease resistance. The greaseproof side (see 3.2.1) of the liner material shall resist the penetration of grease for a minimum of 24 hours and shall not show evidence of delamination, embrittlement, or disintegration. Testing shall be as specified in 4.3.3.1.

3.1.5 Physical strength properties. Liner material shall possess the minimum average physical strength values given in Table I. Testing shall be as specified in 4.3.3.2.

TABLE I

(Minimum average physical strength characteristics)

| | TYPE I | TYPE II |
|---|---|---|
| Bursting strength, points | 30 | 20 |
| Tearing resistance, grams weakest principle direction | 100 | 25 |
| Tensile strength, pounds/inch width, weakest principle direction | 20 | 15 |

3.1.6 Chemical properties. The liner material shall have a hydrogen ion concentration (pH) range of 6.5 to 7.5, with a maximum acid (as $SO_3$) or alkaline (as NaOH) content of 0.02 percent. Testing shall be as specified in 4.3.3.3.

3.2 Marking.

3.2.1 Color identification. The greaseproof side of the liner material shall be marked with readily visible, distinctly red dots approximately 3/8 inch to 1/2 inch in diameter, placed to form lines parallel to the machine direction of the material and to each other, and spaced approximately 1/4 inch to 3/8 inch apart to readily differentiate this material from grade A of MIL-B-121.

3.2.2 Roll identification. Each roll of liner material shall be identified by a tag or sheet of paper printed with the following information:

a. Title, date and number of this specification.
b. Manufacturer's name and address.
c. Type.
d. Month and year of manufacture.
e. Contract and lot number.

3.3 Workmanship. Liner material shall be uniformly constructed, clean, and not have delamination, embrittlement, holes, tears, cuts, wrinkles, sharp creases, cracks, blisters, punctures, chaff marks, scuff marks, or other defects which might impair the usefulness of the material for its intended purposes. Finished material shall not block to such an extent that will cause tearing, delamination, or other injury to the material when unrolled.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Quality assurance terms and definitions. Quality assurance terms and definitions used herein are in accordance with MIL-STD-109.

4.3 Quality conformance inspection.

4.3.1 Inspection lot. Unless otherwise specified (see 6.2), the formation, size and presentation of inspection lots shall be in accordance with MIL-STD-105.

4.3.2 Examination.

4.3.2.1 Sampling. Sampling for examination shall be performed in accordance with MIL-STD-105 and inspected using Acceptable Quality Levels (AQLs) as set forth in applicable sub-paragraphs below, except where otherwise indicated.

4.3.2.2 Examination for visual defects. The sample unit for this examination shall be one yard of material the full width of the roll. No more than five sample units shall be taken from any roll. Defects of each type shall be scored only once within a sample unit. No sample unit shall be taken from the first or last convolution of the roll. Both sides of the material shall be examined:

| Defects | AQL | Inspection method |
|---|---|---|
| Material, not as specified (see 1.2.1 and 3.1.1). | 0.65 | Visual |
| Construction, not as specified (see 3.1.2) | 1.5 | Visual |
| Adherent coating missing, not uniformly applied (when applicable) (see 3.1.2) | 4.0 | Visual |
| Marking, not as specified (see 3.2) | 4.0 | Visual |
| Workmanship (see 3.3) | 4.0 | Visual |

4.3.2.3 Examination for defects in dimensions and roll construction. The sample unit shall be one roll:

| Defects | AQL | Inspection method |
|---|---|---|
| Core length and diameter, not as specified (see 3.1.3) | 1.5 | *SME |
| Roll width, not as specified (see 3.1.3) | 1.5 | *SME |
| Roll assembly:<br>Not suitably restrained to prevent unwinding.<br>Material not wound uniformly on roll causing soft or uneven edges or telescoping of roll.<br>Edges not clean cut; ragged, nicked or crushed edges.<br>Not wound on a fiber core; core broken, crushed, collapsed, or mutilated. | 4.0 | Visual |
| Unwinding of roll:<br>Material sticks together causing tearing or injury to any surface.<br>Wrinkles, sharp creases or folds within the roll.<br>Roll not continuous.<br>More than 2 splices (3 pieces) in roll: Splices not evenly and neatly made; does not cover entire width of material; comes apart during unwinding. | 4.0 | Visual |

*Standard Measuring Equipment.

4.3.2.4 Examination for average length of roll. The sample unit shall be one roll. The length of a roll shall be determined by holding a counter against the face of the roll at a point where the material is not under tension while unwinding the roll. The lot shall be rejected if the average length per roll for all rolls examined is less than the length specified (see 3.1.3).

4.3.2.5 Examination for packing and marking. An examination shall be made to determine that packing and marking requirements of Section 5 are complied with. Defects shall be scored in accordance with the list below. The sample unit shall be one roll:

| Defects | AQL | Inspection method |
|---|---|---|
| Marking, not as specified. | 2.5 | Visual |
| Any nonconforming material or component, component missing, damaged or otherwise defective. | 2.5 | Visual |
| Inadequate application of components. Loose or inadequate sealing. | 2.5 | Visual |

4.3.3 Testing. Unless otherwise specified (see 6.2), all tests shall be performed for the applicable characteristics listed below (see 4.3.3.1, 4.3.3.2 and 4.3.3.3) for each lot presented for examination. The lot size shall be expressed in units of rolls. The sample units shall be one piece of material, the full width of the roll and at least 15 square feet of material. No more than one sample unit shall be taken from any roll. The sample size shall be drawn in accordance with level S-4 for normal inspection and S-3 for reduced inspection of MIL-STD-105. Samples shall include all values upon which results are based and there shall be no failure to meet the sample unit or lot average requirement.

4.3.3.1 Grease resistance testing. Liner material shall be tested for grease resistance (see 3.1.4) using the test methods specified in 4.4.1. The material shall be considered acceptable if no more than one failure occurs in the original 20 specimens. If two specimens in the original 20 show penetration by the grease reagent, or evidence of delamination, embrittlement, or disintegration, the material shall be retested. (Mere staining of the back of the specimen by the grease reagent or dye without transfer to the filter paper shall not constitute a failure). If retesting is done, 20 specimens shall be used. If no more than one failure occurs in the retest, the material shall be considered acceptable. Three or more failures occurring in the original 20 specimens tested will be sufficient cause for rejection of the material without retesting.

4.3.3.2 Physical strength properties testing. Liner material shall be tested for physical strength properties (see 3.1.5) using the test methods specified in 4.4.2. If the average of three tests does not fall within the range specified for the material, the lot represented by the samples shall be rejected.

4.3.3.3 Chemical properties testing. Liner material shall be tested for chemical properties (see 3.1.6) using the test methods specified in 4.4.3. Three determinations shall be made and values averaged to determine compliance with 3.1.6. If the averaged value does not fall within the range specified for the material, the lot represented by the samples shall be rejected.

4.3.4 Certification provisions.

4.3.4.1 Certified test reports (CTR). Unless otherwise specified, the contractor shall make available to the Government a certified test report for each submitted lot of completed rolls by lot number prior to acceptance. This test report is in addition to and not in lieu of any rights of the Government under this contract or law. A CTR may be used as an element incident to, but shall not be used as the sole basis for, Government acceptance of the contract item(s). As a minimum, the report should contain the following:

a. Name of company and date.
b. Contract number or purchase order number, national stock number and drawing number.
c. Complete nomenclature of supplies together with lot number or other identification. The quantity in each lot or shipment will be given.
d. All inspections and tests required by contract (i.e., material, processes, performance, functional, etc) shall be recorded in test reports. These reports shall identify each lot, submitted for acceptance by lot number, the specification or drawing, revision and date, grade or type as applicable, number of specimens tested, specified characteristics and requirements, and actual results obtained.
e. Reports of the raw material producer's chemical and physical analysis.
f. A statement, as follows, certifying that material meets all requirements of the contract:

"The undersigned individually, and as the authorized representative of the contractor, warrants and represents that: All of the information supplied above is true and accurate; the material covered by this certificate conforms to all contract requirements (including but not limited to the drawings and specifications); the inspection and test results, and the analysis appearing herein are true and accurate; and this certification may be used as a basis for payment."

g. Signature and title of certifying official.

4.3.5 Inspection equipment.

4.3.5.1 Acquisition, calibration, maintenance and disposition. Unless otherwise specified (see 6.2), responsibility for acquisition, calibration, maintenance and disposition of acceptance inspection and test equipment, and for all other inspection equipment required by applicable specifications, shall be in accordance with MIL-I-45607.

4.3.5.2 Accuracy of standard measuring equipment. When commercial and modified commercial inspection and test equipment is used, it must be capable of repetitive measurements to an accuracy of 10 percent of the total tolerance of the characteristic being inspected.

4.4 Test methods.

4.4.1 Grease resistance test.

4.4.1.1 Preparation of reagent. Add five grams of anhydrous calcium chloride and one gram of an oil soluble red dye, Calco Oil Red N-1700 or approved equal (see 6.3), to 100 milliliters of pure gum spirits of turpentine, U.S.P. Grade, (specific gravity 0.860 to 0.875 at 60 degrees F). Stopper the container, shake well, and let stand at least 10 hours. Filter through dry filter paper and retain the filtrate in a dry bottle. Add 25 grams of grease, Beacon Grease 325 or approved equal (see 6.4) conforming to MIL-G-3278, to each 100 grams of filtrate. Agitate the turpentine grease mixture by means of a Waring Blender, or equal, until grease is thoroughly dissolved. Store the reagent in a dry bottle having a tightly fitting glass stopper.

4.4.1.2 Procedure. Cut 20 four inch square specimens and condition them for not less than 24 hours at 73° ± 2°F. and 50 ± 5 percent relative humidity. Place each uncreased specimen, greaseproof side up, on a piece of white Whatman number 2 paper that will extend at least 1/2 inch beyond all edges of the specimen. Place a metal ring, weighing 1/4 to 1/2 pound and having dimensions of 5 3/4 ± 1/16 inches outside diameter and 3 3/4 ± 1/16 inches inside diameter on the specimen so that all corners and edges are held in contact with the filter paper. Place five grams of sand, screened to pass through a number 20 U.S. Standard Sieve, in the center of the uncreased specimen and add, by means of a pipette, 1.5 milliliters of the prepared test reagent to the sand. On each specimen place a 50 to 55 gram weight, centered over the saturated sand, to hold the specimen in contact with the filter paper. At the end of two hours, and every hour thereafter for six hours, add 0.5 milliliters of test reagent to the sand to replace that lost by evaporation. Conduct this test at 73° ± 2°F. and 50 ± 5 percent relative humidity. At the end of 24 hours, lift the specimen and examine the filter paper at the point of contact. Any evidence of staining or grease spots on the filter paper, or of delamination, embrittlement, or disintegration of the specimen shall constitute failure to pass the test.

4.4.2 Physical strength properties test. Tests for physical strength properties shall be conducted in accordance with Table III test methods as described in UU-P-31:

TABLE III

Test methods

| | Method |
|---|---|
| Bursting Strength | 112 |
| Tearing resistance | 170 |
| Tensile strength | 171 |
| Atmospheric conditions | 102 |

4.4.3 Chemical properties test.

4.4.3.1 Hydrogen ion concentration (pH). This test shall be in accordance with test method 200 of UU-P-31, with the following changes:

a. Increase individual sample weight to five grams.
b. Increase volume of Erlenmeyer flasks to 500 milliliters.
c. Increase total volume of distilled water used per sample to 250 milliliters.
d. Conduct test in triplicate.
e. Wear rubber gloves when cutting samples to avoid contamination.

Conduct a blank determination as described above using 250 milliliters of distilled water without the sample.

4.4.3.2 Acid or alkaline content. Using the three sample extracts and blank on which the pH determination was made (see 4.4.3.1), titrate these solutions to the pH value of the blank, using 0.01 N HCl or 0.01 N NaOH solutions, whichever is appropriate. Calculate any acidity (in terms of $SO_3$) or alkalinity (in terms of NaOH), as follows:

$$\text{Percent } SO_3 = \frac{T \times N \times 4}{W}$$

where:
T = ml. NaOH required to titrate the extract to the pH of the blank
N = Normality of NaOH solution
W = Weight of test specimen

or

$$\text{Percent NaOH} = \frac{T \times N \times 4}{W}$$

where:
T = ml. of HCl required to titrate the extract to the pH of the blank
N = Normality of HCl solution
W = Weight of test specimen

Three determinations shall be made and values averaged to determine compliance with the requirement specified in 3.1.6.

5. PACKAGING

5.1 Preservation. Not applicable.

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

5.2.1 Levels A and B. Each roll of liner material shall be completely wrapped with one thickness of waterproof barrier material conforming to any Class of PPP-B-1055, except when Class C-1 is used, two thicknesses shall be required. The wrapper shall be closed at the ends by means of inside and outside headers. Seams and headers shall be sealed with water resistant adhesive conforming to MMM-A-260 using a sufficient amount to effect a watertight seal. Unless otherwise specified (see 6.2), wrapped rolls shall be palletized in accordance with MIL-STD-147.

5.2.2 Commercial. Packing shall be in accordance with Fed. Std. No. 356.

5.3 Marking.

5.3.1 Levels A and B. In addition to any special marking required (see 6.2), marking shall be in accordance with MIL-STD-129.

5.3.2 Commercial. Marking shall be in accordance with Fed. Std. No. 356.

6. NOTES

6.1 Intended use. The greaseproof liner material covered by this specification is intended for use as the first inner ply of spirally wound composite containers such as those described in MIL-C-3955.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number and date of this specification.
b. Lists of drawings, standards, and specifications pertinent to the greaseproof liner material, showing applicable revision date.
c. Length and width, if different (see 3.1.3).
d. Inspection lot, if different (see 4.3.3).
e. Testing, if different (see 4.3.3).
f. Responsibilities for acquisition, maintenance, calibration and disposition of measuring and test equipment, if different (see 4.3.5).
g. Selection of applicable level of protection (A or B), or commercial (see 5.2 and 5.3).
h. When palletization is not required (see 5.2.1).
i. Special marking, if required (see 5.3.1).

6.3 Test oil source. Calco Oil Red N-1700 may be obtained from the American Cynamid Company, Calco Chemical Division, Bound Brook, New Jersey.

6.4 Test grease source. Beacon Grease 325 may be obtained from the Standard Oil Company of New Jersey, Elizabeth, New Jersey.

6.5 Type I material. A lamination of 25 pounds per ream (24" x 36" - 500) glassine paper to 30 pounds per ream (24" x 36" - 500) kraft paper has been found to meet the requirements of this specification for Type I material.

6.6 Type II material. A 35 pound basis weight (24" x 36" - 500) vegetable parchment paper has been found to meet the requirements of this specification for Type II material.

Custodian:
Army - WC
Navy - OS
Air Force - 69

Review activities:
Army - MI, SM, EA, WV
Navy - EC, SH
Air Force - 80, 82, 84
Defense Nuclear Agency - DS
Defense General Supply Center - GS

User activities:
Navy - MC, YD, SA
Air Force - 70

Preparing activity:
Army - WC

Project number:
8135-0455

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

INSTRUCTIONS: The purpose of this form is to solicit beneficial comments which will help achieve procurement of suitable products at reasonable cost and minimum delay, or will otherwise enhance use of the document. DoD contractors, government activities, or manufacturers/ vendors who are prospective suppliers of the product are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. 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. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.

DOCUMENT IDENTIFIER AND TITLE

MIL-L-45973A, Liner Material, Greaseproof

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

3. IS THE DOCUMENT RESTRICTIVE?

☐ YES ☐ NO *(If "Yes", in what way?)*

4. REMARKS

SUBMITTED BY *(Printed or typed name and address - Optional)*

TELEPHONE NO.

DATE

DD FORM 1 JAN 72 1426

REPLACES EDITION OF 1 JAN 66 WHICH MAY BE USED

FOLD

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD – 314

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

Commander
Rock Island Arsenal
ATTN: SARRI-LE-S
Rock Island, Illinois 61201

FOLD