

MIL-B-85036A(AS)
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 SUPERSEDING
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MILITARY SPECIFICATION

BARRIER MATERIALS, HEAVY DUTY, FOR FLEXIBLE ENGINE CONTAINERS

This specification has been approved by the Naval Air Systems Command, 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 establishes the requirements for an opaque, heavy duty barrier material, having a low water vapor transmission rate, capable of being heat sealed on both surfaces and intended for use in the fabrication of a reusable flexible engine container (see 6.1).

1.2 Classification. Barrier materials shall be of the following classes, as specified (see 6.1 and 6.2).

Class 1 - General use

Class 2 - Where flame resistance is required

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

TT-S-735	-	Standard Test Fluids, Hydrocarbon
PPP-B-585	-	Box, Wood, Wirebound
PPP-B-601	-	Boxes, Wood, Cleated Plywood

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS (continued)

FEDERAL (continued)

PPP-B-621	-	Box, Wood, Nailed and Lock-Corner
PPP-B-636	-	Box, Shipping, Fiberboard
PPP-B-640	-	Box, Fiberboard, Corrugated, Triple-Wall
PPP-D-723	-	Drum, Fiber
PPP-F-320	-	Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes
PPP-T-60	-	Tape, Packaging, Waterproof
PPP-T-76	-	Tape, Packaging, Paper (for Carton Sealing)
PPP-T-97	-	Tape, Pressure-Sensitive Adhesive, Filament Reinforced

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MIL-S-4461	-	Sealing Machines, Heat, Hot Jaw and Continuous
MIL-L-10547	-	Liners, Case and Sheet, Overwrap, Watervaporproof or Waterproof, Flexible

STANDARDS

FEDERAL

FED-STD-101	-	Test Procedures for Packaging Materials
FED-STD-191	-	Textile Test Methods
FED-STD-595	-	Color

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MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	-	Marking for Shipment and Storage
MIL-STD-147	-	Palletized Unit Loads

(Copies of specifications and standards required by manufacturers in connection with specific acquisition functions should be obtained from the contracting 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. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM D 568	-	Plastics, Flexible, Flammability
ASTM D 3951	-	Standard Practice for Commercial Packaging

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

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 First article inspection. When specified, a sample shall be subjected to first article inspection (see 4.4 and 6.2.1).

3.2 Material. The barrier material shall be made from such materials and by such processes as to insure compliance with this specification.

3.3 Construction. The barrier material shall be constructed of one or more plies in any manner which will insure compliance with the performance requirements of this specification.

3.4 Form. The barrier material shall be furnished in rolls or flat-cut sheets as specified in the contract or delivery order (see 6.2).

3.4.1 Rolls. When rolls are specified, the average length per roll shall not be less than specified by the procuring activity (6.2) and no individual roll shall contain less than 180 yards. Unless otherwise specified the width of roll material shall be 36 inches with a tolerance of plus 1/4 inch or minus 1/8 inch.

3.4.1.1 Core. The roll material shall be uniformly and smoothly wound on non-returnable fiber cores with a minimum inside diameter of 3 inches with a tolerance of plus 1/8 inch or minus 0 inches. The length of the core shall be equal to the width of the roll material, with a tolerance of plus 1/8 inch or minus zero inches. The core shall be of sufficient rigidity to prevent distortion of the roll under normal conditions of shipment and use. Each roll shall be suitably restrained to prevent unwinding.

3.4.1.2 Splices. No roll shall contain more than 3 splices (4 pieces), and no piece shall be less than 45 yards in length. Splices within rolls shall be evenly and neatly made, the entire width of the roll material and shall not come apart during unwinding of the roll. Rolls containing splices shall be flagged at both ends of each splice with colored markers to indicate splices within the roll. Barrier material in flat-cut sheets shall contain no splices.

3.4.2 Sheets. When flat cut sheets are specified, the length and width shall be as specified by the acquiring activity (see 6.2). Unless otherwise specified, length and width tolerances for cut sheets shall be plus 1/4 inch or minus 1/8 inch. Flat-cut sheets shall be evenly and uniformly stacked.

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3.5 Sealing. Barrier materials shall be capable of being heat-sealed under conditions recommended by the manufacturer. These sealing conditions shall be such as are considered reasonable for production line sealing operations with respect to commonly available sealing equipment and practical commercial fabrication time. The material shall exhibit no delamination at the heat-sealed area when sealed under the manufacturer's recommended conditions (see 4.7).

3.6 Identification of material. The barrier material under contract or order shall be marked with specification number, class, manufacturer's name, manufacturer's designation, month and year of manufacture and lot number. The letters and figures shall be clear, legible, and a minimum of one-eighth of an inch high. The markings shall be made using a water-resistant ink and shall appear on the backing surface of the material. The complete markings shall be continuous with a maximum of two inches between groups of markings. A complete group of markings shall appear once in each 18 inches of width of the roll or sheet. The color of the markings shall approximate the lusterless black which conforms to color No. 37038 of FED-STD-595. Each roll or package (flat cuts) of barrier material shall include a tag secured to the core of rolls or a sheet inserted in the package of sheets with the sealing conditions, as furnished by the manufacturer, to be used as a guide by users for satisfactory heat-sealing on rotary, band, and jaw type sealing equipment. The tag or sheet shall be visible upon opening the unit package.

3.7 Physical properties. The physical properties of the barrier material shall conform to the requirements specified in Table I, when tested as described in Section 4.

3.8 Workmanship. Barrier material shall be manufactured in a manner to provide uniform construction, free from holes, tears, cuts, sharp creases, wrinkles or other imperfections which might impair its usefulness for the purpose intended. The barrier material shall be trimmed of any selvage and the finished product shall conform to the levels of quality established herein.

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

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

- (a) First article inspection (see 4.4).
- (b) Quality conformance inspection (see 4.5).

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4.3 Inspection conditions. Unless otherwise specified, the inspections of this specification shall be made under atmospheric conditions. Material in atmospheric conditions is defined as material which is in moisture equilibrium with an atmosphere having a relative humidity of 50 ± 5 percent and a temperature of $73^\circ \pm 3.5^\circ\text{F}$.

4.4 First article inspection. First article inspection shall include all examinations and tests of this specification. Approval of the first article samples shall not relieve the supplier of his obligation to meet the quality conformance inspection (see 4.5).

4.4.1 First article test samples. Samples for first article inspection shall consist of one sample of each class representative of the barrier material which has been produced by the contractor using the same production process, procedures and equipment as will be used in fulfilling the contract. The manufacturer shall submit a copy of test results showing conformance with the first article inspection requirements of this specification (see 6.2).

4.5 Quality conformance inspection.

4.5.1 Lot formation. For purposes of sampling, an inspection lot for examinations and tests shall consist of all material of the same class made by the same process from the same components by one manufacturer and submitted for delivery at one time.

4.5.2 Sampling. Sampling for inspection shall be performed in accordance with the provisions set forth in MIL-STD-105, except where otherwise indicated.

4.5.3 Quality conformance tests. Quality conformance tests shall consist of the tests listed in Table II.

4.5.4 Quality conformance examinations. Examination of the barrier material shall be in accordance with paragraphs 4.5.4.1 through 4.5.4.5 inclusive. Inspection levels and acceptable quality levels (AQL's) shall be in accordance with 4.5.4.6.

4.5.4.1 Examination of the barrier material for defects in appearance, construction and workmanship. For examination of defects within rolls, the sample unit of product shall be two yards of the full width roll. For examination of sheets, the sample unit shall be two sheets randomly selected from a package. No more than five sample units randomly selected shall be drawn from any one roll or package of sheets, as applicable. Both sides of the material shall be examined. Defects of each type shall be scored only once for each occurrence within each linear yard for rolls and once per sheet.

EXAMINE

DEFECT

Form

Not roll or flat cut, as specified.
Incorrect class of material.

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EXAMINEDEFECT

Appearance	Surfaces not clean; presence of any foreign matter, dirt, sand, grit or oil spots. (Note: Defects do not apply to outer convolution of roll).
Workmanship	Blister, crack, cut, hole (not including pinholes), tear, sharp crease or wrinkle, chafed spot or scuff mark. (Note: Defects do not apply to outer convolution or roll). Evidence of delamination or embrittlement. Edges not clean cut; ragged, crushed or uneven edges.
Construction	Not uniform; layer or section missing, any selvage.
Identification Markings	Illegible, incorrect, incomplete or omitted.
	Do not appear on backing surface of material; not continuous lengthwise.
	Do not appear once in each 18 inches of width of roll or sheet.
	Do not conform to height specified in 3.6; color not lusterless black as specified.

4.5.4.2 Examination of the barrier material for defects in roll or package fabrication. The sample unit for this examination shall be one roll or one package of sheets, as applicable.

EXAMINEDEFECTS

Assembly of sheets	Not evenly and uniformly stacked; sheet containing manufacturer's instructions for sealing conditions of material not visible upon opening package.
	Adjacent sheets stuck together to the extent that separation causes tearing or injury to any surface.
	Splice within sheet.
Assembly of roll	Not suitably restrained to prevent unwinding.
	Material not wound uniformly and smoothly on roll causing soft or uneven edges or telescoping of roll.
	Material not wound on a substantial rigid fiber core; core broken, collapsed, crushed or mutilated.

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Unwinding of roll (check both sides) When unwound, material sticks together to the extent that unrolling causes tearing or injury to any surface.

Material wound unevenly causing wrinkles, sharp creases or folds within the roll.

Roll not continuous; more than three splices (four pieces) in roll or more than one splice in any 45 consecutive yards.

Splices not evenly and neatly made; does not cover entire width of material; comes apart during unwinding of roll.

Manufacturer's instructions for sealing conditions of the material not securely attached to the core of roll.

4.5.4.3 Examination of the barrier material for dimensional defects. The sample unit for this examination shall be one roll or one package of sheets, as applicable.

EXAMINEDEFECTS

Sheets	Length or width varies by more than minus 1/8 inch or plus 1/4 inch from dimensions specified.
Rolls	
Width	Varies by more than minus 1/8 inch or plus 1/4 inch from width specified.
Core	Length less than width of roll material or greater by more than plus 1/8 inch. Inside diameter less than 3 inches or greater than 3 1/8 inches.
Identification Markings	Lettering less than 1/8 inch in height. More than two inches distance between lengthwise group of markings.

4.5.4.4 Examination of the barrier material for length per roll or count per package. The sample unit for this examination shall be one roll or one package of sheets, as applicable.

EXAMINEDEFECT

Rolls	Average length per roll less than specified. Length of any individual roll less than 180 yards.
Sheets	Average count of sheets per unit package less than specified quantity.

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4.5.4.5 Examination of packaging. An examination shall be made to determine that packaging complies with the requirements of Section 5 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.

EXAMINEDEFECT

Preservation
(as applicable)

Not level specified; not in accordance with contract requirements.

Flat sheets not unit packaged and wrapped as specified; fiberboard pad(s) omitted from top or bottom of stack or not of size sufficient to protect sheets; strapping or ties not applied in manner specified.

Material not as specified; closures not accomplished by specified or required methods or materials.

Packing
(as applicable)

Not level specified; not in accordance with contract requirements.

Rolls not packed in fiber drums, as specified.

Arrangements or number of rolls or unit packages of sheets per container not in accordance with requirements.

Container material not as specified; closures not accomplished by specified or required methods or materials.

Markings

Interior or exterior markings (as applicable) illegible, incorrect, omitted or not in accordance with requirements. Precautionary markings omitted or not as specified.

Weight

Weight exceeds requirements of container specification.

4.5.4.6 Inspection levels and acceptable quality levels (AQLs) for examinations. The inspection levels for determining the sample size and the acceptable quality levels (AQLs) expressed in defects per 100 units, shall be as follows:

<u>EXAMINATION PARAGRAPH</u>	<u>INSPECTION LEVEL</u>	<u>AQL</u>
4.5.4.1	I	6.5
4.5.4.2	S-4	6.5
4.5.4.3	S-4	6.5
4.5.4.4	S-4	6.5
4.5.4.5	S-4	6.5

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(a) The same rolls, sheets or packages of sheets of the specified class of material shall be used for examination under 4.5.4.1 through 4.5.4.4 inclusive. The yardage or sheets used for examination under 4.5.4.1 and the rolls, sheets or packages of sheets used for examinations under 4.5.4.3 and 4.5.4.4 shall be within the rolls or packages of sheets randomly selected under 4.5.4.2.

(b) For average length, the acceptance number is zero.

4.6 Quality conformance testing. Quality conformance testing of the barrier material shall be performed for the applicable characteristics specified in Table II for each lot presented for examination for each class of material. The sample unit for testing rolls shall be one piece, full width of roll and of sufficient length to provide three square yards of material. For cut sheets the sample unit shall be three square yards randomly selected throughout the lot. No more than one sample unit shall be drawn from any one roll or package.

4.7 Sealing instructions.

(a) All seals for test purposes shall be a minimum of 1/2 inch wide and shall be effected on a jaw type heat sealer conforming to MIL-S-4461, Type I, Class B or Type II, Class A, Styles 1, 2, 3 or 4 utilizing the sealing conditions recommended by the manufacturer. The proper sealing conditions reasonable for production line sealing operations with respect to commonly available sealing equipment and commercially practical fabrication time are a temperature setting of 525°F, a 3-second dwell time and a pressure of 60 pounds per square inch.

(b) In the securing of the three 1-inch seam strength specimens from their respective samples (see 4.8.2.2.1) care should be taken that the specimens are not removed:

(1) From points in the sealed sample where seal overlapping has occurred.

(2) From points in the sealed sample which were within one inch of either end of the sealer jaw during the sealing operation.

4.8 Test methods.

4.8.1 Test procedures. The tests indicated below shall be conducted in accordance with methods as specified in the indicated documents:

<u>Test</u>	<u>Method of FED-STD-101</u>	<u>Special Requirements or Exception Notes</u>
WVTR after room temp. flexing (as rec'd and aged)	3030	Note 1

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<u>Test</u>	<u>Method of FED-STD-101</u>	<u>Special Requirements or Exception Notes</u>
WVTR after low temp. flexing (as rec'd)	3030	Note 2
Blocking resistance	3003 Procedure D	
Contact corrosivity	3005	
Curl resistance	2015	Note 3
Puncture resistance	2065	
	<u>Method of FED-STD-191</u>	
Breaking strength (grab method)	5100	Note 4
Flame resistance (Class II material only)	ASTM D 568	Note 5

NOTES:

1. As received and aged specimen shall be flexed (max. flexing - 6 inches) in accordance with Method 2017 prior to conducting the WVTR test. The specimen shall be aged by exposure to an atmosphere of 80 to 85 percent R.H. and $160 \pm 2^\circ\text{F}$ for 72 consecutive hours.
2. As received specimen shall be conditioned prior to flexing for at least 30 minutes at $-20^\circ \pm 2^\circ\text{F}$. The flexing operation (max. flexing - 6 inches) shall be conducted in accordance with Method 2017 at $-20^\circ \pm 2^\circ\text{F}$.
3. Test at $73^\circ \pm 3.5^\circ\text{F}$ and $50 \pm 5\%$ R.H. only. Specimens shall not be suspended. They shall be placed on a horizontal plane.
4. Test shall be conducted and the average breaking strength reported on five specimens in the machine direction and on five specimens in the cross directions on both unaged and aged specimens. Aged material shall be material which has been exposed to an atmosphere of 80 to 85 percent R.H. and $160 \pm 2^\circ\text{F}$ for 72 consecutive hours. Aging shall be accomplished on a large sheet of material. Individual test specimens shall then be cut from the aged sheet.
5. Clamp the specimen, without gauge marks, vertically on a "U" shaped holder (see 6.3) so that the specimen is held rigid on three sides with the bottom end exposed to the flame.

4.8.2 Seam strength (face to face seal).

4.8.2.1 Seam strength sampling. Six by twelve inch sections shall be selected from the applicable samples as shown in Figure 1.

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4.8.2.2 Seam strength (as received).

4.8.2.2.1 Preparation of test specimen. The six sections for this test (Fig. 1, Key 1) shall be folded in half with the crease parallel to the long axes. The opened unfolded length shall be heat sealed. The heat seal areas shall be defined by a line drawn along the sealer jaw with a sharp No. 2B graphite pencil. The folded edge shall be cut off to a depth of 1/2 inch from the fold. From each of the six sections, three adjacent 1 inch wide specimens shall be cut perpendicular to the seam (see 4.7). One of the specimens from each section shall be used for test at room temperature (73°F), one from each section for test at 100°F and the remaining one from each section for test at 160°F. After heat sealing and prior to the application of the specified weights, the specimens in all cases shall be exposed for one hour to the atmospheric conditions specified in 4.3.

4.8.2.2.2 Test at room temperature. The six 1-inch specimens selected for this test (see 4.8.2.2.1) shall be opened and one end of each specimen shall be clamped so that the other end of the specimen hangs freely. A 3 1/2-pound weight shall then be gently attached to the free end of the specimen so as not to impact-load the seal. The weight shall be allowed to act for 5 minutes, whereupon the weight shall be removed and the specimen examined for separation of the heat seal faces. Any evidence of delamination of one ply away from the other in the heat seal area shall be cause for rejection of the sample unit. The evaluation shall be limited to the heat seal area defined in 4.8.2.2.1.

4.8.2.2.3 Test at 100°F. The six 1-inch wide specimens selected for this test (see 4.8.2.2.1) shall be tested as per room temperature except that specimens shall be clamped in a forced draft circulating air oven maintained at $100 \pm 2^\circ\text{F}$ with a weight of two pounds acting on the free end of the specimen for one hour. The rate of air circulation shall be held to the minimum required to maintain uniform temperature throughout the oven. In no case shall the rate of air circulation be such as to cause any movement of the weighted specimens. The weights shall be attached after the specimens and test clamp fixtures have been placed in the oven and shall be removed prior to taking the specimen from the oven in order to avoid excessive loading due to swaying action. After one hour the weight shall be removed and the specimen examined for separation of the heat sealed faces. Any separation exceeding 1/4 inch in any of the six specimens as evidenced by the delamination of one ply away from the other in the heat seal area defined in 4.8.2.2.1 shall be cause for rejection of the sample unit.

4.8.2.2.4 Test at 160°F. The six 1-inch wide specimens selected for this test (see 4.8.2.2.1) shall be tested as for those at 100°F except that the weight shall be 10 ounces and the temperature in the forced draft circulating air oven shall be $160 \pm 2^\circ\text{F}$. The rate of air circulation shall be held to the minimum required to maintain uniform temperature throughout the oven. In no case shall the rate of air circulation be such as to cause any movement of the weighted specimens.

4.8.2.3 Seam strength (sealed before aging).

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4.8.2.3.1 Test specimens. Prepare the six test specimens as described in 4.8.2.2.1 this time using Key 2 (see Fig. 1). After heat sealing, the samples shall be aged in a circulating air oven maintained at $160^{\circ} \pm 2^{\circ}\text{F}$ for 12 consecutive days (228 hours). After aging, 1-inch wide specimens as described in 4.8.2.2.1, shall be cut from the sections to be tested at room temperature (73°F), 100°F and 160°F .

4.8.2.3.2 Test at room temperature. The six 1-inch specimens selected for this test (see 4.8.2.3.1) shall be tested as specified in 4.8.2.2.2.

4.8.2.3.3 Test at 100°F . The six 1-inch wide specimens selected for this test (see 4.8.2.3.1) shall be tested as specified in 4.8.2.2.3.

4.8.2.3.4 Test at 160°F . The six 1-inch wide specimens selected for this test (see 4.8.2.3.1) shall be tested as specified in 4.8.2.2.4.

4.8.2.4 Seam strength (sealed after aging).

4.8.2.4.1 Test specimens. The sections for this test (Fig. 1, Key 3), in the flat unsealed condition as taken from the sample roll, shall be aged in a circulating air oven maintained at $160^{\circ} \pm 2^{\circ}\text{F}$ for 12 consecutive days (288 hours). After removal from the oven the unsealed sections shall be allowed to come to room temperature. Test specimens shall then be obtained as described in 4.8.2.2.1.

4.8.2.4.2 Test at room temperature. The six 1-inch wide specimens selected for this test (see 4.8.2.4.1) shall be tested as specified in 4.8.2.2.2.

4.8.2.4.3 Test at 100°F . The six 1-inch wide specimens selected for this test (see 4.8.2.4.1) shall be tested as specified in 4.8.2.2.3.

4.8.2.4.4 Test at 160°F . The six 1-inch wide specimens selected for this test (see 4.8.2.4.1) shall be tested as specified in 4.8.2.2.4.

4.8.3 Seam strength (face to back seal).

4.8.3.1 Seam strength sampling. Thirty-six pieces of material, three by twelve inches, shall be selected for this test.

4.8.3.2 Seam strength (as received).

4.8.3.2.1 Preparation of test specimens. Use twelve pieces for the "as received" tests (see Figure 1, Key 4). Place the face film of one piece of material down on a flat surface. Place the face film of another piece of material over top of the first piece. Heat seal with a 1/2 inch seal. From each of the six sections so prepared, three adjacent one-inch wide specimens shall be cut perpendicular to the seam (see 4.8.2.2.1). One of the specimens from each section shall be used for test at room temperature (73°F), one from each section for test at 100°F and the remaining one from each section for test at 160°F . After heat sealing and prior to the application of the specified weights, the specimens in all cases shall be exposed for one hour to the atmospheric conditions specified in 4.3.

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4.8.3.2.2 Test at room temperature. The specimens selected for test shall be tested as specified in 4.8.2.2.2..

4.8.3.2.3 Test at 100°F. The specimens selected for test shall be tested as specified in 4.8.2.2.3.

4.8.3.2.4 Test at 160°F. The specimens selected for test shall be tested as specified in 4.8.2.2.4.

4.8.3.3 Seam strength (sealed before aging).

4.8.3.3.1 Test specimens. The sections for this test (see Figure 1, Key 5) shall be heat sealed as in 4.8.3.2.1. After heat sealing, the samples shall be aged in a circulating air oven maintained at $160 \pm 2^\circ\text{F}$ for 12 consecutive days (288 hours). After aging, specimens as described in 4.8.3.2.1 shall be cut from the sections for test at room temperature, 100°F and 160°F.

4.8.3.3.2 Test at room temperature. The six specimens selected for this test (see 4.8.3.3.1) shall be tested as specified in 4.8.3.2.2.

4.8.3.3.3 Test at 100°F. The six specimens selected for this test (see 4.8.3.3.1) shall be tested as specified in 4.8.3.2.3.

4.8.3.3.4 Test at 160°F. The six specimens selected for this test (see 4.8.3.3.1) shall be tested as specified in 4.8.3.2.4.

4.8.3.4 Seam strength (sealed after aging).

4.8.3.4.1 Test specimens. The twelve pieces for this test (see Figure 1, Key 6) in the flat unsealed condition as taken from the sample roll, shall be aged in a circulating air oven maintained at $160 \pm 2^\circ\text{F}$ for 12 consecutive days (288 hours). After removal from the oven the unsealed pieces shall be allowed to come to room temperature. Test specimens shall then be prepared as described in 4.8.3.2.1.

4.8.3.4.2 Test at room temperature. The six specimens selected for this test (see 4.8.3.4.1) shall be tested as specified in 4.8.3.2.2.

4.8.3.4.3 Test at 100°F. The six specimens selected for this test (see 4.8.3.4.1) shall be tested as specified in 4.8.3.2.3.

4.8.3.4.4 Test at 160°F. The six specimens selected for this test (see 4.8.3.4.1) shall be tested as specified in 4.8.3.2.4.

4.8.4 Seam fabrication (fin type seal).

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4.8.4.1 Preparation of test specimens. Pouches sealed in accordance with the manufacturer's recommended sealing conditions shall be fabricated from the barrier material. Each pouch shall be prepared by cutting four specimens, two 2 1/2 by 5 1/2 inches and two 5 1/2 by 5 1/2 inches. The pouch shall be fabricated by sealing in conformance with Figure 2. The intermediate vertical butt seals shall be made prior to sealing the bottom. The butt seals by sealing at 1/2 inch seams perpendicular to the faces shall be made prior to sealing the bottom. The butt seams shall be folded flat at the point of juncture with the bottom seams before the bottom seam is made.

4.8.4.2 Procedure. A water solution shall be prepared as specified in method 5009 of FED-STD-101. The solution shall be poured into each sealed pouch to a level of two inches (above the top of the bottom seam). The pouch shall then be suspended. After a period of 15 minutes at room temperature, the pouches shall be examined for dye leakage at all seams and especially at the double seam junctions, i.e. the points where the vertical seams intersect the bottom seam at points other than at the corners of the pouch.

4.8.5 Aging resistance. Three specimens, 36 by 6 inches, cut from across the roll of material, at points at least 1 yard apart, shall be used for this test.

4.8.5.1 Procedure. The specimens shall be subjected to the following aging cycle:

- (a) 8 hours in a humidity chamber at $100 \pm 2^\circ\text{F}$ and 90 to 95 percent relative humidity.
- (b) 16 hours in a circulating air oven at $160 \pm 2^\circ\text{F}$.

The aging cycle shall be repeated on every week day, Monday thru Friday. The specimens shall remain in the circulating air oven maintained at the conditions described above on Saturday, Sunday and holidays, except that holidays shall not exceed a total of two days over the entire aging period. The aging procedure shall continue for 14 consecutive days. The specimens shall be folded, loosely hung, rolled loosely or laid flat in the test chamber during the aging period. At the conclusion of the aging period, the specimens shall be returned to room temperature and examined, particularly at all edges, for delamination brought about by the aging exposure. No supplemental attempt to delaminate the material, such as prying or picking at the plies, shall be carried out. For purposes of this test, delamination shall be defined as ply separation at any one given point exceeding in more than 1/2 inch from the edge with an edge length separation greater than 1 inch.

4.8.6 Oil resistance.

4.8.6.1 Preparation of test pouch. Eight 3 by 6 inch samples of the material shall be folded in half. A sharp crease shall be made by placing the folded sample between two smooth flat surfaces and applying a weight equal to 6 pounds per inch of crease, on top of the fold for 30 seconds, so as to act on the sample only. The samples shall then be unfolded and recreated in a similar manner at right angles to the first crease. The sample shall be made into a 3 by 3 inch pouch by folding the sample in half and sealing the two sides.

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4.8.6.2 Procedure. Approximately 5 ml of petroleum base oil conforming to Type VI of TT-S-735 (ASTM Oil NO. 3) shall be placed in four of the pouches, and the pouches sealed. In the remaining four pouches place approximately 5 ml of di-2 ethylhexylsebacate (see 6.4) synthetic base oil and seal the pouch. Care shall be exercised to exclude oil from the heat sealing area. The pouch shall be hung in an oven maintained at $160 \pm 2^\circ\text{F}$ for 24 hours. Provisions should be made to catch any possible oil seepage. The pouch shall be removed, allowed to come to room temperature, and examined for oil leakage. The three sealed edges shall then be cut off, and the oil removed. The sheet shall then be pulled taut and examined for swelling, delamination or other visible defects. A test for delamination of the face film shall be conducted by placing the test specimen between the thumb and forefingers so that the thumbs rest on the heat seal face. The thumbs shall then be thrust forward and outward in a finger-snapping motion in such a manner that the heat seal face will delaminate if it is loosely bonded.

5. PACKAGING

5.1 Preservation. The levels of preservation shall be level A or industrial, as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Rolls. Each roll, wound on a core as required in Section 3, requires no additional preservation.

5.1.1.2 Flat cuts. Bundles of flat cuts shall be placed in fiberboard boxes conforming to PPP-B-636, weather resistant class. In lieu of closure and waterproofing requirements in the Appendix of PPP-B-636, closure and waterproofing of weather resistant boxes shall be accomplished by sealing all seams, corners and manufacturer's joints with waterproof tape, 2 inches minimum width, conforming to PPP-T-60 or PPP-T-76. Banding (reinforcement requirements) shall be applied in accordance with the Appendix to PPP-B-636, using nonmetallic or tape banding only.

5.1.1.3 Alternate method for flat cuts. When specified (see 6.2), flat cuts of material shall be packaged in bundles having a maximum weight of 50 pounds and shall be sandwiched between two fiberboard pads conforming to PPP-F-320, weather resistant class. Bundles shall be tied or otherwise secured with flat steel bands, plastic strapping, fiber-twine or rope, two in each direction, of strength to assure safe arrival of the bundle. The fiberboard pads shall be of a size commensurate with the size of the flat cuts so as to prevent damage to the barrier material during the banding operation, particularly on the edges.

5.1.2 Industrial. Rolls and flat cuts shall be preserved in accordance with ASTM D 3951. Unit pack weight limits may be exceeded when the rolls exceed the specified weight limit.

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

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5.2.1 Level A.

5.2.1.1 Rolls. Each roll of material, preserved as specified in 5.1 shall be packed in a fiber drum conforming to PPP-D-723, Type II, Grade D. Drum closure shall be sealed with three-inch wide, waterproof, pressure-sensitive tape conforming to PPP-T-60 or PPP-T-76. When specified, two or more drums shall be overpacked in wirebound wood, cleated plywood or nailed wood boxes conforming to PPP-B-585, Class 3; PPP-B-601, Overseas Type with Type II Class 2 plywood; or PPP-B-621, Class 2, respectively (see 6.2).

5.2.1.2 Flat cuts. Flat cuts preserved in weather resistant fiberboard boxes (5.1.1.2) or bundled (5.1.1.3), shall be packed directly in wirebound wood, cleated plywood or nailed wood boxes conforming to PPP-B-585, Class 3; PPP-B-601, Overseas Type with Type II, Class 2 plywood or PPP-B-621, Class 2. When wirebound wood, cleated plywood or nailed wood boxes are used for sandwiched bundles, they shall be lined with a waterproof case liner conforming to MIL-L-10547 and sealed in accordance with the appendix thereto.

5.2.1.3 Unit loads. When specified, fiber drums and boxes shall be palletized in accordance with MIL-STD-147, Type XIII and Type I, respectively.

5.2.2 Level B.

5.2.2.1 Rolls. Each roll of material shall be packed as specified for level A in 5.2.1.1, except that drums shall conform to PPP-D-723, Type I, Grade D. Closure shall be sealed with three-inch wide reinforced tape conforming to PPP-T-97 or equivalent.

5.2.2.2 Flat cuts. Bundles of flat cuts, preserved in weather resistant fiberboard boxes, will require no further packing.

5.2.2.2.1 Alternate method for flat cuts. When specified, bundles of flat cuts shall be packed as specified for level A in 5.2.1.2, except that shipping containers shall conform to PPP-B-585, Class 2; PPP-B-601, Overseas Type with Type III, Class I plywood; PPP-B-621, Class 2; PPP-B-636, Grade V3C; or PPP-B-640, Class 2, Style E.

5.2.2.3 Unit loads. When specified, fiber drums and boxes shall be palletized in accordance with MIL-STD-147, Type XIII and Type I, respectively.

5.2.3 Industrial. Rolls and flat cuts shall be packed in accordance with ASTM D 3951. Unit pack weight limits may be exceeded when rolls exceed the specified weight limit.

5.3 Marking. All individual packages and shipping containers shall be marked for shipment in accordance with MIL-STD-129 and as follows:

Stock No.
BARRIER MATERIALS, HEAVY DUTY, FOR FLEXIBLE
ENGINE CONTAINERS

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Specification MIL-B-85036A(AS)

Class

Size - Nominal net lineal yardage of roll or dimensions of flat cuts (Net lineal yardage is the number of yards of usable material in the roll)

Contract or order number

Name and address of manufacturer

Month and year of manufacture

Lot number

5.3.1 Precautionary marking. The following marking shall appear on at least one side and, wherever practicable, on two sides of each drum or box in letters not less than 3/4 inch in height:

"Keep Cool and Dry"

6. NOTES

6.1 Intended use.

6.1.1 Use. The material covered by this specification is intended for use in the fabrication of a protective system for the shipping and storage of jet engines where the use of a watervaporproof, heat sealable, opaque, heavy duty barrier material is required.

6.1.2 Class 1. Class 1 material is intended for general use.

6.1.3 Class 2. Class 2 material is intended for use where flame resistance is required.

6.2 Ordering data. Requests, requisitions, schedules and contracts or orders should specify the following:

- (a) Title, number and date of this specification
- (b) Class of barrier material (see 1.2)
- (c) Quantity
- (d) Form (rolls or flat cut) and length or sheet size required (see 3.4)
- (e) Levels of preservaion and packing required (see 5.1 and 5.2)
- (f) Alternate method of packaging for flat cuts if desired (see 5.1.1.3)
- (g) Alternate method of packing if desired (see 5.2.2.2.1)
- (h) Overpacking of rolls if desired (see 5.2.1.1)
- (i) Palletization, if desired (see 5.2.1.3 and 5.2.2.3)
- (j) If first article inspection is desired (see 4.4)

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6.2.1 First article. When a first article inspection is required, the item will be tested and should be a first article sample of each class of the barrier material. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations.

6.3 Specimen holder. The "U" shaped specimen holder (see 4.8.1 Note 5), shall be similar to the specimen holder described in Method 5903 of Fed. Test Method Std. 191, Figure 5903 C except that the inside dimension of this specimen holder shall be 3/4 inch.

6.4 Source of material. A material called out in the various tests may be obtained from the following source:

Material

Di-2 ethylhexylsebacate
(Multiplex DOS)

Sources

The C.P. Hall Company
7300 South Central Avenue
Chicago, Illinois 60638

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

Preparing Activity
Navy - AS
(Project No. 8135-N542)

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TABLE I. Physical Properties.

Property	Requirement Classes 1 and 2	Paragraph Reference
Seam strength (face to face seal) sealed as received:		
At room temperature (Separation-Inches)	None	4.8.2.2.2
At 100°F and 160°F (Separation-Inches)	1/4 (max)	4.8.2.2.3 and 4.8.2.2.4
sealed, then aged 12 days at 160°F:		
At room temperature (Separation-Inches)	None	4.8.2.3.2
At 100°F and 160°F (Separation-Inches)	1/4 (max)	4.8.2.3.3 and 4.8.2.3.4
aged 12 days at 160°F, then sealed:		
At room temperature (Separation-Inches)	None	4.8.2.4.2
At 100°F and 160°F (Separation-Inches)	1/4 (max)	4.8.2.4.3 and 4.8.2.4.4
Seam strength (face to back seal) sealed as received:		
At room temperature, (Separation-Inches)	None	4.8.3.2.2
At 100° and 160°F (Separation-Inches)	1/4 (max)	4.8.3.2.3 and 4.8.3.2.4
sealed, then aged 12 days at 160°F:		
At room temperature, (Separation-Inches)	None	4.8.3.3.2
At 100°F and 160°F (Separation-Inches)	1/4 (max)	4.8.3.3.3 and 4.8.3.3.4
aged 12 days at 160°F, then sealed		
At room temperature, 100°F and 160°F (Separation-Inches)	None	4.8.3.4
Seam fabrication (fin type seal)	No leakage at double seam junction	4.8.4
Aging resistance:		
8 hrs at 100 ± 2°F and 90-95 RH	No delamination	4.8.5
16 hrs at 160 ± 2°F	No delamination	
Oil resistance mineral and synthetic base oil	No leakage, swelling, delam- ination or embrittlement	4.8.6

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TABLE I. Physical Properties. (continued)

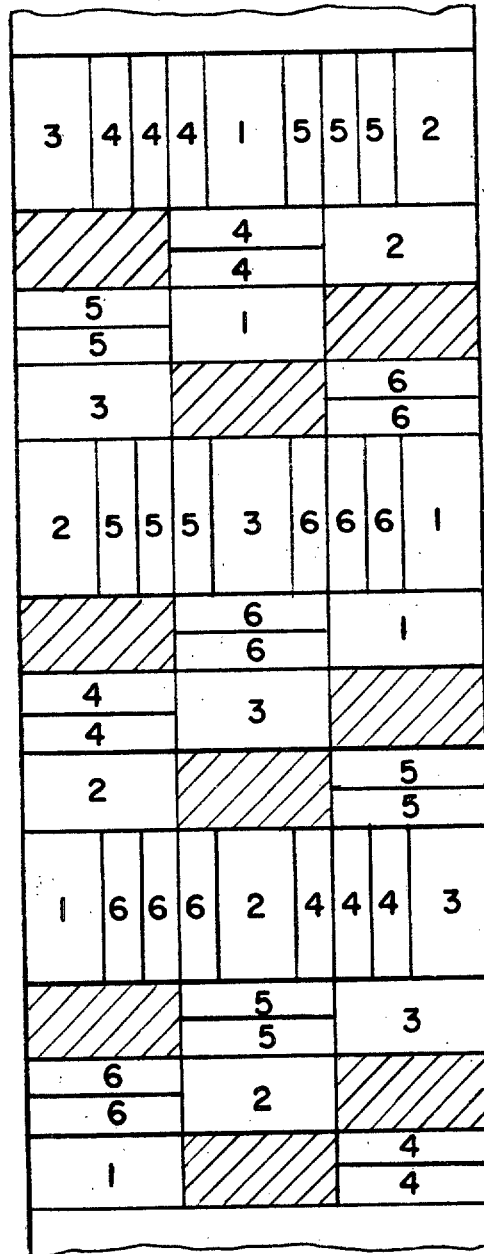
Property	Requirement Classes 1 and 2	Paragraph Reference
Blocking resistance	No blocking, delamination or rupture	4.8.1
Contact corrosivity	No corrosion	4.8.1
Puncture resistance	80 lbs. (min)	4.8.1
Curl resistance	Shall not curl in excess of 5% or curl back upon itself	4.8.1
Watervapor transmission rate (WVTR)		
After room temperature flexing: (as received) (gm./100 sq. in./24 hrs.)		
Flexed machine direction	0.02 (max)	4.8.1
Flexed cross-machine	0.02 (max)	4.8.1
After room temperature flexing: (aged) (gm./100 sq. in./24hrs.)		
Flexed machine direction	0.02 (max)	4.8.1
Flexed cross-machine	0.02 (max)	4.8.1
After low temperature flexing: (as received) (gm./100 sq. in./24 hrs.)		
Flexed machine direction	0.03 (max)	4.8.1
Flexed cross-machine	0.03 (max)	4.8.1
Breaking strength (grab method) as received:		
Machine direction	200 lb. (min)	4.8.1
Cross direction	200 lb. (min)	4.8.1
After aging:		
Machine direction	200 lb. (min)	4.8.1
Cross direction	200 lb. (min)	4.8.1
Flame resistance (Class 2 material only)	Nonburning or self-extinguish in 2 sec. (max)	4.8.1

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TABLE II. Quality Conformance Tests.

Test	Requirement Classes 1 and 2	Paragraph Reference
Seam strength (face to face seam) at room temperature (Separation-Inches):		
Sealed as received	None	4.8.2.2.2
Sealed then aged 12 days at 160°F	None	4.8.2.3.2
Seam strength (face to back seal) at room temperature (Separation-Inches):		
Sealed as received	None	4.8.3.2.2
Sealed then aged 12 days at 160°F	None	4.8.3.3.2
Seam fabrication (fin seal)	No leakage at double seam junction	4.8.4
Oil resistance	No leakage, swelling, delam- ination or embrittlement	4.8.6
Puncture resistance	80 lbs. (min)	4.8.1
Cur1 resistance	Shall not curl in excess of 5% or curl back upon itself	4.8.1
WVTR (gm./100 sq. in./24 hrs.) as received; flexed in each direction	0.02 (max)	4.8.1

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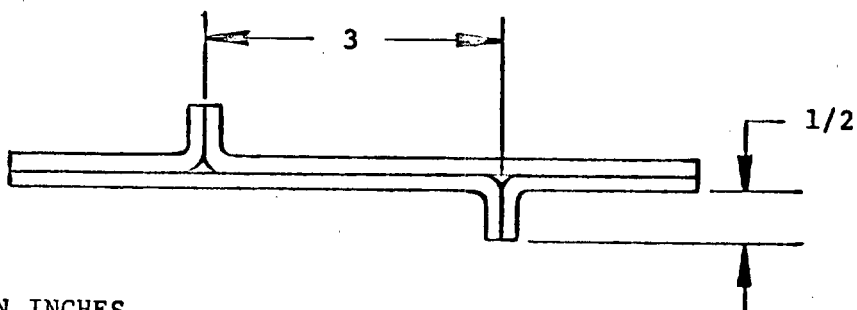
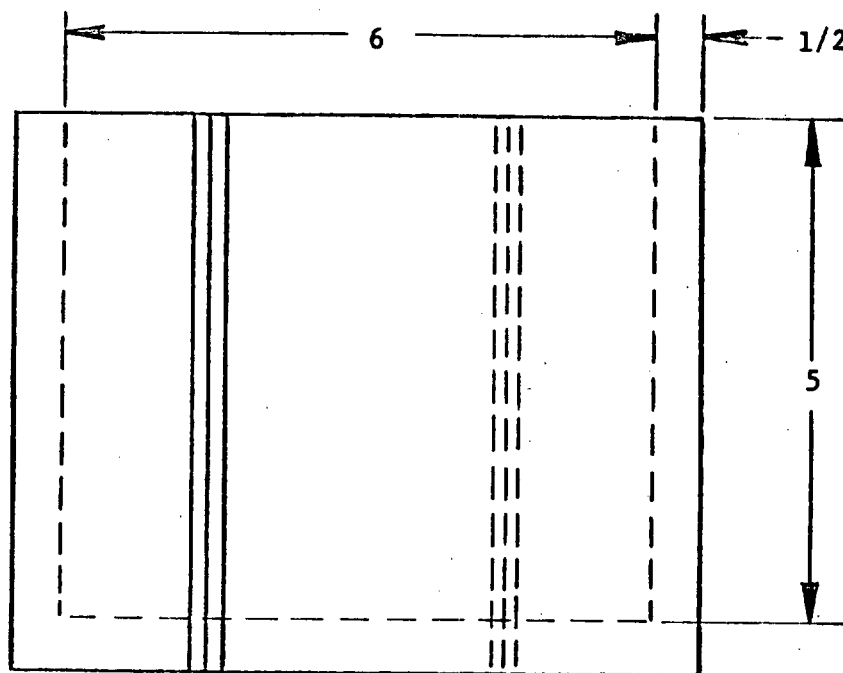
MACHINE
DIRECTION
OF ROLL

KEY

- 1 - 6 inch by 12 inch sample for "as received" testing (fin type seal)
- 2 - 6 inch by 12 inch sample for sealed before aging testing (fin type seal)
- 3 - 6 inch by 12 inch sample for sealed after aging testing (fin type seal)
- 4 - 3 inch by 12 inch sample for "as received" testing (Lap type seal)
- 5 - 3 inch by 12 inch sample for sealed before aging testing (Lap type seal)
- 6 - 3 inch by 12 inch sample for sealed after aging testing (Lap type seal)

Figure 1. Sampling method for seam strength test.

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DIMENSIONS IN INCHES.

Figure 2. Pouch for seam fabrication test.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-B-85036A(AS)	2. DOCUMENT TITLE BARRIER MATERIALS, HEAVY DUTY, FOR FLEXIBLE ENGINE CONTAINERS
3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION (Mark one)
b. ADDRESS (Street, City, State, ZIP Code)	<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____
5. PROBLEM AREAS	
c. 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)

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)