NOT MEASUREMENT SENSITIVE

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10 August 2009
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PERFORMANCE SPECIFICATION

BARRIER MATERIALS, FLEXIBLE, ELECTROSTATIC DISCHARGE PROTECTIVE, HEAT-SEALABLE

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

1. SCOPE

1.1 Scope. This specification establishes the requirements for heat-sealable, electrostatic discharge protective, flexible barrier materials used for the military packaging of microcircuits, sensitive semiconductor devices, sensitive resistors, and associated higher assemblies. In addition, the type I materials provide for watervaporproof protection and attenuation of electromagnetic interference effects (see 6.1).

1.2 Classification. The barrier materials are furnished in the following types and classes.

Type I - Watervaporproof, electrostatic protective, electrostatic and electromagnetic shielding.

Class 1 - Suitable for hand operated or automated sealing equipment.
Class 2 - Suitable for automated sealing equipment.

Type III - Transparent, waterproof, electrostatic protective, electrostatic shielding.

Class 1 - Suitable for hand operated or automated sealing equipment.
Class 2 - Suitable for automated sealing equipment.

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 4L8000B120-3, Highway 547, Lakehurst, NJ 08733-5100 or email to Michael.Sikora@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil.

AMSC N/A FSC 8135

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL SPECIFICATIONS

QQ-S-698 - Steel, Sheet and Strip, Low Carbon.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-3010 - Test Procedures for Packaging Materials.

(Copies of these documents are available on line at http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

J-STD-006 - Electronic Grade Solder Alloys and Fluxed and Non-Fluxed. Solid Solders for Electronic Soldering Applications Requirements (DoD adopted).

(Copies of this document are available from www.ansi.org or the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ-Z1.4	-	Procedures, Sampling and Tables for Inspection by Attributes (DoD adopted).

(Copies of this document are available from www.asq.org or the American Society for Quality, 600 Plankinton Avenue, Milwaukee, WI 53203.)

ASTM INTERNATIONAL

ASTM-B451	-	Copper Foil, Strip, and Sheet for Printed Circuits. and Carrier Tapes, Specification for.
ASTM-D257	-	Resistance DC or Conductance of Insulating Materials (DoD adopted).
ASTM-D471	-	Rubber Property – Effect of Liquids (DoD adopted).
ASTM-F15	-	Iron-Nickel-Cobalt Sealing Alloy, Specification for.
ASTM-F1249	-	Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor, Standard Test Method for.

(Copies of these documents are available online at www.astm.org or from ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.)

ELECTRONIC COMPONENTS ASSOCIATION (ECA) / ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA-541	-	Packaging Material Standards for ESD Sensitive Items.

(Copies of this document are available from http://ec-central.org/index.cfm or ECA/EIA, Standards and Technology, 2500 Wilson Blvd., Suite 310, Arlington, VA 22201.)

ELECTROSTATIC DISCHARGE ASSOCIATION (ESD)

ANSI/ESD STM11.31	-	Evaluating the Performance of Electrostatic Discharge Shielding Materials – Bags, Standard Test Method for.

(Copies of this document are available from www.esda.org or the Electrostatic Discharge Association, 7900 Turin Rd, Bldg 3, Rome, NY 13440-2069.)

SAE INTERNATIONAL

SAE-AMS- QQ-A-250/4	-	Aluminum Alloy 2024, Plate and Sheet. (DoD Adopted)

(Copies of this document is available from www.sae.org or SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 Qualification. The barrier materials furnished under this specification shall be products that are authorized by the Qualifying Activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.4).

3.2 Material. Barrier materials shall be made from such materials and by such processes as to ensure compliance with the performance requirements of this specification.

3.3 Construction. Barrier materials shall be constructed of one or more plies in any manner which ensures compliance with the performance requirements of this specification.

3.3.1 Type I. Butting of type I component materials or the finished product is not permitted except in the direction perpendicular to the rolling direction. When a butt weld is made on the finished product or any ply thereof, the areas shall be externally flagged with color markers to prevent use of that portion of the roll.

3.3.2 Type III. Type III barrier material shall be transparent, clear, or tinted any color. The appearance shall be the same throughout the material. Butting of component materials or the finished product is not permitted except in the direction perpendicular to the rolling direction. When a butt weld is made on the finished product or any ply thereof, the areas shall be externally flagged with colored markers to prevent use of that portion of the roll.

3.3.3 Splices. A roll shall not contain more than 3 splices (4 pieces) and each piece shall be not less than 45 yards in length. Splices within rolls shall be even 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 not contain splices (see 4.3.2.2).

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

3.4.1 Rolls. The width of roll material shall be 36 inches, with a tolerance of plus or minus ¼ inch. The average length of roll material shall be not less than 200 yards. The length of any

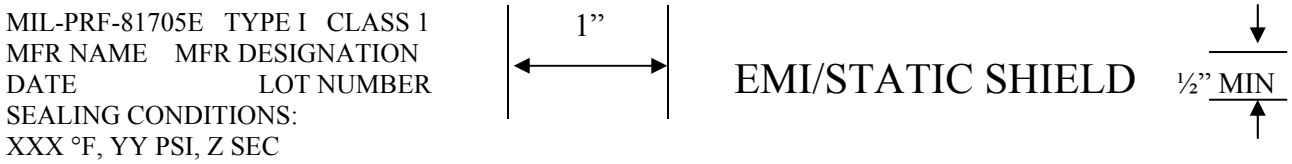
individual roll shall be not less than 195 yards. The roll material shall be uniformly wound on nonreturnable cores. The inside diameter of the core shall be not less than 3 inches, with a tolerance of plus ⅛ inch. The length of the core shall be equal to the width of the roll material, with a tolerance of plus ⅛ inch. The core shall be rigid to prevent distortion of the roll during use and shipment conditions. Each roll shall be restrained to prevent unwinding (see 4.3).

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). If the length and width tolerances for cut sheets are not specified, the tolerance for each shall be plus ¼ inch or minus ⅛ inch (see 4.3). Flat cut sheets shall be evenly stacked (see 4.3).

3.5 Sealing. The barrier material shall exhibit no delamination of the sealed area when sealed according to the manufacturer's recommended conditions (see 4.5). The barrier material identification of material markings shall include the sealing conditions (see 3.6). Each roll or package (flat cuts) of barrier material shall include a tag secured to the core of rolls, or sheet inserted in the package of sheets with the sealing instructions for impulse seals and for heat-sealing on rotary, band and jaw type sealing equipment. The tag or sheet shall be visible upon opening the unit package (see 4.3).

3.6 Identification of material. The barrier material shall have two groups of markings in block form and in machine direction. Group A marking shall state the specification number, type, class, manufacturer's name, manufacturer's designation, month and year of manufacture, lot number and heat sealing conditions (temperature, pressure and dwell time). The letters and figures shall be clear, legible, and shall be not less than ⅛ inch high. Group B markings shall identify the protective qualities of the materials as follows: For type I – EMI/STATIC SHIELD and for type III – STATIC SHIELD. These letters shall be not less than ½ inch high. The two groups of markings on all three types of material shall be either printed using a water-resistant ink or embossed and shall be visible if the material is fabricated into a bag or pouch. The two groups of markings shall be printed or embossed sequentially, complete, and continuous lengthwise with a space of one inch between groups. A complete group of markings shall appear once in each six inches of width of the roll and flat cut. An example of the identification is as follows (see 4.3):

NOTE: Both Date and Lot Number shall change for each production run.



3.7 Performance requirements. The performance of the barrier materials shall conform to the requirements specified in table I, when tested in accordance with 4.6.

3.8 Workmanship. Barrier material surfaces shall be free from any foreign matter. Barrier material shall be free from holes, tears, cuts, sharp creases, wrinkles, or other imperfections. The barrier material shall be cut and trimmed of any selvage (see 4.3.2.1).

TABLE I. Performance requirements.

Characteristics	Applicable to types	Requirements	Test Paragraph Reference
Seam Strength	I, III		4.6.1
1. As received material sealed & tested:			
a. At room temperature (separation-inches)		No separation	
b. At 100 °F and at 160 °F (separation-inches)		No separation	
2. Sealed before aging at 160 °F for 12 days and tested:			
a. At room temperature (separation-inches)		No separation	
b. At 100 °F and at 160 °F (separation-inches)		No separation	
3. Sealed after aging at 160 °F for 12 days and tested:			
a. At room temperature (separation-inches)		No separation	
b. At 100 °F and at 160 °F (separation-inches)		No separation	
Seam Fabrication	I, III	No leakage at any seams	4.6.2
Water vapor transmission rate (WVTR)	I		
1. After room temperature flexing:			
a. As received (gms/100 sq. in./24 hrs.)		0.02 (max)	4.6.1
b. Aged (gms/100 sq. in./24 hrs.)		0.02 (max)	
2. After low temperature flexing:			
As received (gms/100 sq. in./24 hrs.)		0.03 (max)	

TABLE I. Performance requirements – Continued.

Characteristics	Applicable to types	Requirements	Test Paragraph Reference
Water vapor transmission rate (WVTR) (Modulated Infrared Sensor) As received (gms/100 sq. in./24 hrs)	I	0.0005 (max)	4.6.5
Blocking resistance	I, III	No blocking, delamination, or rupture	4.6.1
Resistance to curl	I, III (Class 1)	No curl in excess of 5% or curl back upon itself	4.6.1
Contact corrosivity	I, III	No corrosion, etching, or pitting	4.6.1
Aging resistance	I, III (laminated only)	No delamination	4.6.3
Thickness	I III	0.010 inch (max) 0.006 inch (max)	4.6.1
Water resistance of markings	I, III (printed only)	Markings shall be clear and legible	4.6.1
Marking abrasion resistance	I, III	Shall be legible	4.6.6
Water resistance	I, III (laminated only)	No delamination	4.6.1
Transparency	III	Lettering shall be legible 3 inches behind material	4.6.1
Oil resistance (delamination)	I, III (laminated only)	No leakage, swelling, delamination, or embrittlement	4.6.1
Waterproofness	III	No dye penetration	4.6.4
Puncture resistance	I, III	10 lbs (min) 6.0 lbs (min)	4.6.1
Static decay	I, III	The decay shall be not greater than 2.0 seconds	4.6.1
Electromagnetic interference (EMI) attenuation	I III	25 db (min) 10 db (min)	4.6.7

TABLE I. Performance requirements – Continued.

Characteristics	Applicable to types	Requirements	Test Paragraph Reference
Surface resistivity	I, III	Inner: Greater than or equal to $1x10^5$ ohms/sq but less than $1x10^{12}$ ohms/sq. Outer: less than $1x10^{12}$ ohms/sq	4.6.8
Electrostatic shielding Voltage test Energy test	I, III	 30 volts peak (max) 10nJ (max)	4.6.9
Storage stability 1. Seam strength (use as received conditions) 2. Surface resistivity 3. Static decay 4. Electrostatic shielding Voltage test Energy test	 I, III I, III I, III	 No separation Inner: Greater than or equal to $1x10^5$ ohms/sq but less than $1x10^{12}$ ohms/sq. Outer: less than $1x10^{12}$ ohms/sq Not greater than 2 seconds 30 volts peak (max) 10nJ (max)	4.6.10

4. VERIFICATION

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

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 Qualification inspection. The qualification inspection shall consist of all tests and examinations of this specification.

4.3 Conformance inspection. Conformance inspections consist of the required tests listed in table II and the examinations listed in tables III through V for each production run.

4.3.1 Sampling for conformance inspection. Sampling for inspection shall be performed in accordance with the provisions set forth in ASQ-Z1.4.

4.3.2 Examination of the end item. For the purpose of determining the sample size in accordance with ASQ-Z1.4, the lot size shall be expressed in units of rolls or packages of sheets, as applicable, for examinations specified in 4.3.2.1 through 4.3.2.3.

TABLE II. Conformance tests.

Characteristics	Paragraph Reference
Seam strength	--
As received	4.6.1
Sealed after aging	4.6.1
Water vapor transmission rate (type I only)	4.6.1
As received	4.6.1
After aging	4.6.1
Oil resistance (laminated only)	4.6.1
Static decay	4.6.1
Surface resistivity	4.6.8
Electrostatic shielding	4.6.9
Puncture resistance	4.6.1

4.3.2.1 Examination of the end item for defects in appearance, construction, and workmanship (see table III). For examination of defects within rolls, the sample unit of product shall be two yards, the full width of the 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 barrier material shall be examined.

4.3.2.2 Examination of the end item for defects in general construction (see table IV). The sample unit for this examination shall be one roll or one package of sheets, as applicable.

4.3.2.3 Examination of the end item for dimensional defects (see table V). The sample unit for this examination shall be one roll or one package of sheets, as applicable.

TABLE III. Examination of end item for defects in appearance, construction, and workmanship.

EXAMINATION	DEFECT
Form	Not roll or flat cut, as specified. Incorrect type or class of material.
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, tear, sharp crease, chafed spot or scuff mark. (Note: Defects do not apply to outer convolution of roll.) Evidence of delamination or embrittlement. Edges not clean cut; ragged, crushed, or uneven.
Construction	Not uniform; layer or section missing, selvage present, fish eyes.
Identification markings	Illegible, incorrect, incomplete, or omitted. Not continuous lengthwise. Not printed or embossed. Complete marking not repeated as specified in 3.6. Tags or sheets not properly located or missing.

TABLE IV. Examination of end item for defects in general construction.

EXAMINATION	DEFECT
Assembly of sheets	Not evenly and uniformly stacked; sheet containing manufacturer's sealing conditions not visible upon opening. Adjacent sheets stick together to the extent that separation causes tearing or injury to any surface. Splice within sheet.
Assembly of roll	Not restrained to prevent unwinding. Material not wound uniformly on roll causing soft or uneven edges, or telescoping of roll. Material not wound on rigid core, core broken, collapsed, crushed, mutilated.
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 roll. Roll not continuous; more than 3 splices (4 pieces) in roll or more than 1 splice in any 45 or less consecutive yards. Splice(s) not evenly made; does not cover entire width of material; comes apart during unwinding of roll.

TABLE V. Examination of the end item for dimensional defects.

EXAMINATION	DEFECT
Sheets	Length or width varies by more than plus ¼ inch or minus ⅛ inch from dimensions specified.
Rolls: Width Length	 Varies by more than plus or minus ¼ inch from width specified. Length of any individual roll is less than 195 yards, or the average length of roll material is less than 200 yards.
Core	Length of core is less than width of roll material or greater by more than plus ⅛ inch. Inside diameter less than 3 inches or greater than 3 ⅛ inches.
Identification markings	Lettering is less than ⅛ inch in height for Group A markings. Lettering is less than ½ inch in height for Group B markings. The complete grouping (A and B) does not appear every 6 inches lengthwise.

4.4 Test conditions. Unless otherwise specified in the detailed test methods herein, the physical tests contained in this specification shall be made with an atmosphere having a relative humidity of 50 ± 5 percent and a temperature ranging from 70 to 76 °F. Barrier material shall be considered in equilibrium after exposure to the above conditions for a minimum of 24 hours.

4.5 Sealing instructions for qualification and conformance testing.

a. All seals for test purposes shall be not less than ½ inch wide and shall be effected on a jaw-type heat-sealer or equivalent as approved by the qualifying activity utilizing the sealing conditions recommended by the manufacturer. These conditions shall be limited as follows (see 6.3):

(1) Maximum temperature = 525 °F
(2) Maximum dwell time = 3 seconds
(3) Maximum pressure = 60 psig

b. Impulse seals for test purposes shall be a minimum of ¼-inch wide and shall be effected on impulse sealers, or equivalent as approved by the qualifying activity. The upper sealing limits on the sealer shall effect a seal and not cause thinning at the inside edges of the seal.

4.6 Verification of performance requirements.

4.6.1 Test methods. Unless otherwise specified, the tests in table VI shall be conducted in accordance with the identified methods of MIL-STD-3010.

TABLE VI. Test methods.

Tests	Applicable to Types	MIL-STD-3010 Test Method No.	Special Requirement or Exception Note
Water vapor transmission rate After room temperature flexing (as received and aged)	I	2017	1/
Transmission rate procedure	I	3030	--
Water vapor transmission rate After low temperature flexing	I	2017	2/
Transmission rate procedure	I	3030	--
Seam strength	I, III	2024	3/
Puncture resistance	I, III	2065	4/
Blocking resistance	I, III	3003	--
Resistance to curl	I, III (Class 1 only)	2015	5/
Contact corrosivity	I, III	3005	6/
Oil resistance (delamination)	I, III (laminated only)	3015	7/
Water resistance	I, III (laminated only)	3028	8/
Water resistance of marking	I, III (printed only)	3027	9/
Static decay	I, III	4046	10/
Transparency	III	4034	11/
Thickness	I, III	1003	11/

1/ Full stroke shall be used on both as received and aged specimens. A WVTR test result for any specimen which is greater than that specified in table I shall be cause for rejection.

2/ Conduct tests as specified in MIL-STD-3010, Method 2017 except that only 'as received' specimens shall be tested. Prior to flexing, test specimens shall be conditioned for at least 30

minutes at -20 ± 2 °F. The flexing operation shall be conducted at -20 ± 2 °F. A WVTR test result for any specimen which is greater than that specified in table I shall be cause for rejection. In addition, any cracking in the heat sealed area after low-temperature flexing shall be cause for rejection.

3/ Any evidence of ply delamination in the heat-sealed area shall be cause for rejection. The evaluation shall be limited to the heat-sealed area.

4/ Test shall be run on 5 specimens with the heat sealable face in contact with the probe and 5 specimens with the non-heat-sealable face contacting the probe. The average value of each set of specimens shall meet the requirement specified in table I.

5/ Three specimens shall be tested for each principal direction. Specimens shall not be suspended, but shall be placed on a horizontal surface.

6/ The following test surfaces shall be used for testing. Exposure at 65% humidity shall be for 72 hours, except that low carbon steel shall be exposed for 20 hours and shall only be used for type I testing.
   a. Low carbon steel, QQ-S-698, condition 5 (1010 steel) (type I only).
   b. Aluminum alloy,SAE-QQ-A-250/4 (2024 bare)
   c. Copper, ASTM-B451.
   d. Silver plating (100-200 microinches) on copper, ASTM-B451.
   e. Tin-lead eutectic solder coating, J-STD-006 (SN63, 200-500 microinches) on copper, ASTM-B451.
   f. Stainless steel, UNS30200.
   g. Kovar, ASTM-F15.

7/ Oil conforming to ASTM oil number 3, as specified in ASTM-D471, and a di-2-ethylhexyl sebacate synthetic oil shall both be used.

8/ Use distilled water. Delamination shall be measured as ply separation at any one given point extending more than ½ inch from the edge, with an edge length separation greater than one inch.

9/ Three specimens shall be tested, each one containing a complete set of markings.

10/ The average value for the three specimens tested for each preconditioning exposure shall meet the requirement specified in table I, except that preconditioning using the aging resistance test procedure (4.6.3.2) shall replace the continuous water shower preconditioning for type III. The decay time shall be defined as the time to dissipate 99 percent of the initial 5000 volt charge (both positive and negative). Testing shall be performed in an atmosphere maintained at 73 ± 5 °F and 12 ± 3 percent relative humidity.

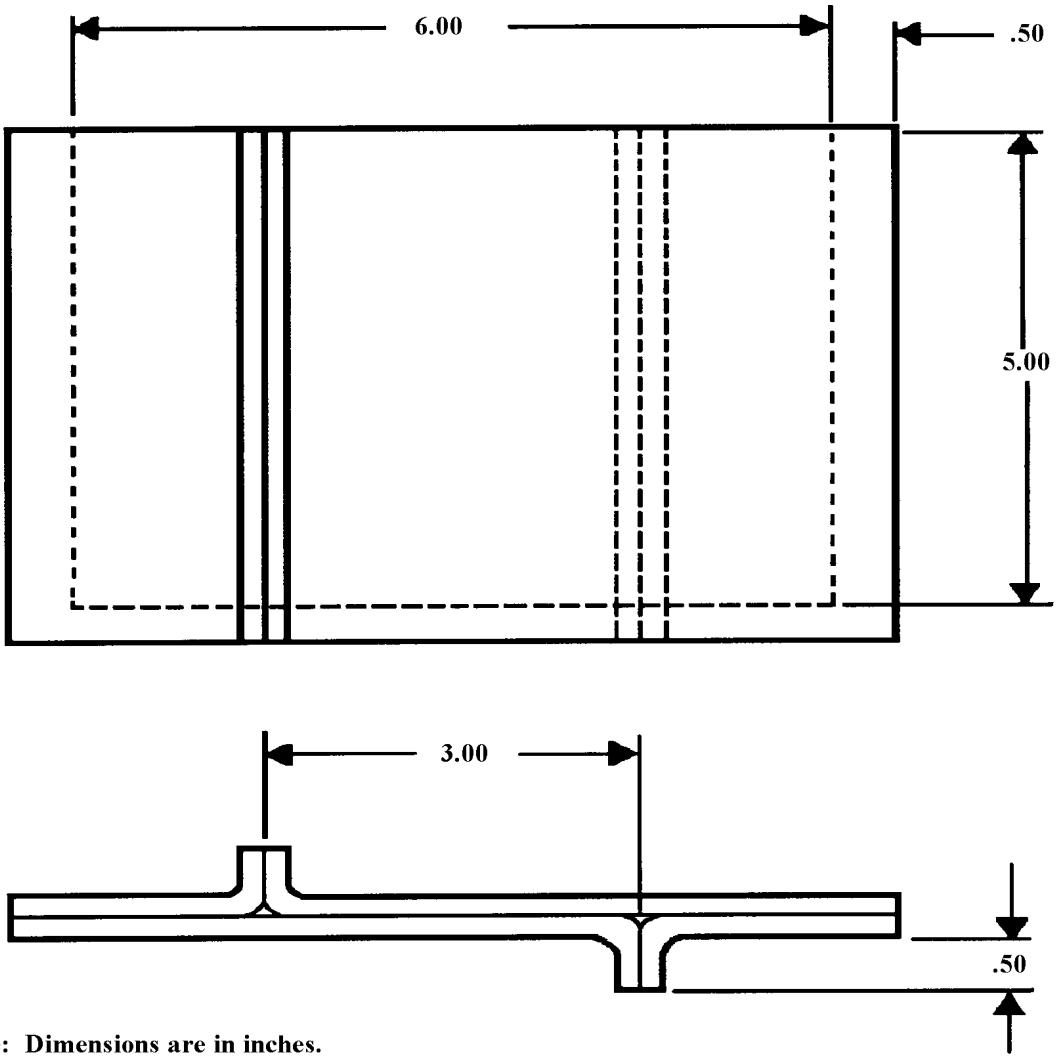
11/ Three specimens shall be tested.

4.6.2 Seam fabrication.

4.6.2.1 Preparation of test specimens. Four 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 ½ by 5 ½ inches, and two 5 ½ by 5 ½ inches. The pouch shall be fabricated by sealing as shown on figure 1. The butt seals projecting at ½ 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 seals are made.

4.6.2.2 Procedure. A solution of dioctyl sodium sulfosuccinate (0.1% by weight Aerosol OT or equivalent) in distilled water shall be prepared and a dye added to produce a distinct color, as approved by the qualifying activity. 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 vertically. 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 (the points where the vertical seams intersect the bottom seam at points other than at the corners of the pouch).



Note: Dimensions are in inches.

FIGURE 1. Pouch for seam fabrication test.

4.6.3 Aging resistance. Aging resistance shall be used to determine delamination characteristics of the barrier material as well as to condition specimens for the static decay test.

4.6.3.1 Test specimens.

4.6.3.1.1. Delamination specimens - Three specimens, 36 by 6 inches, cut from across the roll of material, at points which shall be not less than 1 yard apart.

4.6.3.1.2. Static decay specimens - Three specimens, 3.5 by 5.5 inch, randomly selected from the test roll.

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

8 hours in a humidity chamber at 100 ± 2 °F and 90 to 95 percent relative humidity.
16 hours in a circulating air oven at 160 ± 2 °F.

The specimens shall be placed in a temperature/humidity programmable chamber and the aging cycle repeated for a total of 14 days. The chamber shall be capable of achieving 90% of the change in temperature within 15 minutes and in humidity within 30 minutes. The aging resistance specimens shall be folded loosely, hung, rolled loosely or laid flat in the test chamber during the aging period. The static decay specimens shall be suspended in the chamber and shall be secured to prevent curling. At the conclusion of the aging period the specimens shall be returned to room temperature and evaluated as specified in 4.6.3.2.2.

4.6.3.2.1 Alternate procedure. The aging cycle specified in 4.6.3.2. shall be repeated every weekday, for five consecutive days. 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 fourteen 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.

4.6.3.2.2. Evaluation of specimens. The delamination specimens shall be 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 occur if ply separation at any one given point extends in more than ½ inch from the edge with an edge length separation greater than 1 inch. The static decay samples shall be subjected to the static decay test in 4.6.1.

4.6.4 Waterproofness.

4.6.4.1 Test preparation. Flexing procedure shall be conducted in accordance with

MIL-STD-3010, Method 2017, except that only un-aged specimens shall be tested. Prior to flexing, the test specimens shall be conditioned for 30 minutes at –20 ± 2 °F and the flexing operation shall be conducted at –20 ± 2 °F.

4.6.4.2 Procedure. After flexing the specimen, the sleeve shall be removed. Allow the specimen to come to room temperature and dry by wiping with an absorbent material or by placing in a circulating air oven maintained at 160 °F for 10 minutes. The sleeve shall be removed and made into a pouch by sealing one end. The pouch shall be filled with shredded absorbent paper. The pouch shall then be placed in a solution of dioctyl sodium sulfosuccinate (0.1% by weight Aerosol OT or equivalent in distilled water with methyl violet dye added for distinct color) for ten minutes. The pouch shall then be removed, wiped dry, and the shredded absorbent paper examined for dye stain.

4.6.5 WVTR (modulated infrared sensor). A suitably sized sample of barrier material shall be installed on a calibrated device for measuring moisture permeation through an area of approximately 50 cm^2 in accordance with ASTM D1249. The surface of the sample designed for heat sealing shall be oriented toward the dry gas with the other side oriented towards a 100 percent relative humidity environment. The test temperature shall be 100 °F (38 °C). The material shall be tested for permeation, allowing a minimum of 80 hours to reach steady state. Three samples shall be tested and the results averaged.

4.6.6 Marking abrasion resistance.

4.6.6.1 Preparation of test specimens. Strips 3-inches-wide containing markings shall be cut so that the amount of markings shall be at maximum. The length shall allow for a bifold seam to be formed and stapled, the resultant strip shall be 3 inches wide by 18 inches long (see figure 2).

4.6.6.2 Procedure. The test bar shall be 1-⅜ to 1-½ inch in diameter and shall be covered with 400 grit abrasive cloth. The strip shall be hung over the bar with 0.9 ± 0.5 pounds weight attached to one end (see figure 2). The side with the print or raised embossing shall be in contact with the bar. The other end shall be pulled (stroked) at a rate of 50 to 70 strokes per minute for 1 minute. The stroke length shall be 13 to 16 inches. The angle of pull (stroke) shall be within 5 degrees of horizontal. The strip shall be removed and the weight detached. The printing shall be examined for legibility, smear, and blurring in accordance with the requirement in table I.

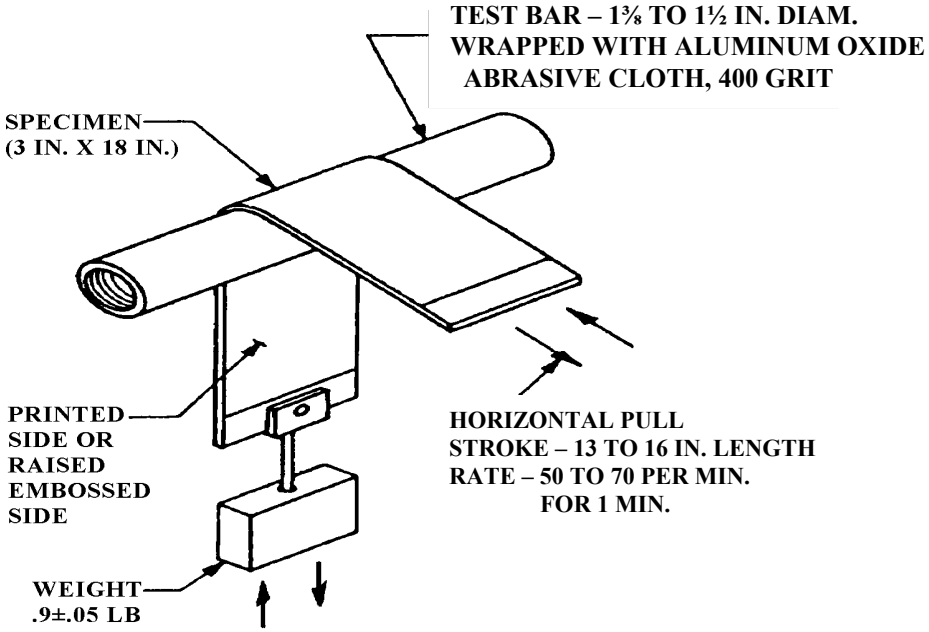


FIGURE 2. Apparatus for testing identity markings resistance to abrasion.

4.6.7 EMI attenuation. The measuring technique is intended for determining Radio Frequency (RF) attenuation characteristics of the type I and type III barrier material. Specimens shall be tested as received and after flexing in accordance with MIL-STD-3010, Method 2017, using the full stroke flexing motion prior to testing.

4.6.7.1 Preliminary steps. The following measurement technique shall be used at 500 MHz intervals from 1.0 to 10.0 GHz.

a. An aperture of 7 by 7 inches shall be cut into the access panel of an RF shielded chamber.

b. The test equipment shall consist of an RF signal generator with a transmit horn antenna as the RF source and a HP spectrum analyzer or EMI receiver with receive horn antenna as the measurement system. Test equipment shall be set up as shown on figure 3.

c. The receive horn antenna shall be placed inside the RF shielded chamber and centered both horizontally and vertically with the 7 by 7 inch opening of the aperture at a distance that shall be not less than 1.65 feet from the test sample.

d. The transmit horn antenna shall be placed outside the RF shielded chamber and centered both horizontally and vertically with the 7 by 7 inch opening of the aperture at a distance that shall be not less than 1.65 feet from the test sample.

e. The total distance between the transmit horn antenna and the receive horn antenna shall be not less than 3.3 feet. This distance is not critical, but once set it shall not be changed during the testing without repeating both the open aperture and sheet metal/closed aperture setup tests.

4.6.7.2 Test procedure.

a. Keep the 7 by 7 inch aperture uncovered.

b. The transmit horn antenna shall be positioned, as specified in 4.6.7.1, to produce dynamic range that shall be not less than 35 decibels, between an open aperture and a sheet metal/closed aperture, for the entire frequency range of 1.0 GHz through 10.0 GHZ. This position shall be determined by placing the transmit horn antenna at the test position and adjusting the signal generator to produce a minimum signal level of 35 decibels above the noise, floor of the spectrum analyzer or EMI receiver, with the 7 by 7 inch opening (aperture) uncovered. A sheet metal plate shall be placed over the opening and the test repeated at the same power output level used for the open aperture test to ensure that a dynamic range of over 35 decibels is achieved. A signal level shall be selected for each test frequency in order to provide the required dynamic range.

c. Tune receiver or spectrum analyzer to obtain a display or indication.

d. Record readings from signal generator (frequency and output level) and receiver or spectrum analyzer signal level.

e. Repeat steps (b), (c) and (d) at all test frequencies. Ensure that signal generator (frequency and output level) is the same as recorded in step (d).

f. Cut a square of sheet metal (same material as test barrier) 8 by 8 inches. Using silver epoxy or equivalent as approved by the qualifying activity, apply the adhesive evenly around the 7 by 7 inch open aperture such that a flat ribbon of ½ inch is present around the perimeter of the opening. Place the sheet metal square symmetrically over the opening with ½ inch overlap on all four sides and press evenly and firmly to ensure a secure bond between the two surfaces. Conductive tape or 7 inch magnetic strips also may be used to fasten the sheet metal or the test sample to the open aperture in place of the silver epoxy.

g. Repeat steps (b), (c) and (d) at all test frequencies. Ensure that the signal generator (frequency and output level) is the same as recorded in step (d).

h. Remove the sheet metal plate installed in step (f) and using the same procedure described in step (f), fasten the test sample to be tested. The outer surface of the test sample shall face the transmitting horn. Repeat steps (b), (c) and (d) at all test frequencies. Ensure that the signal generator (frequency and output level) and frequency shall be the same as recorded in step (d).

i. The difference (in decibels) between the spectrum analyzer or receiver's readings in step (d) and step (h) is the attenuation characteristics of the test sample. This reading shall not exceed the differences (in decibels) between the readings in step (d) and step (g).

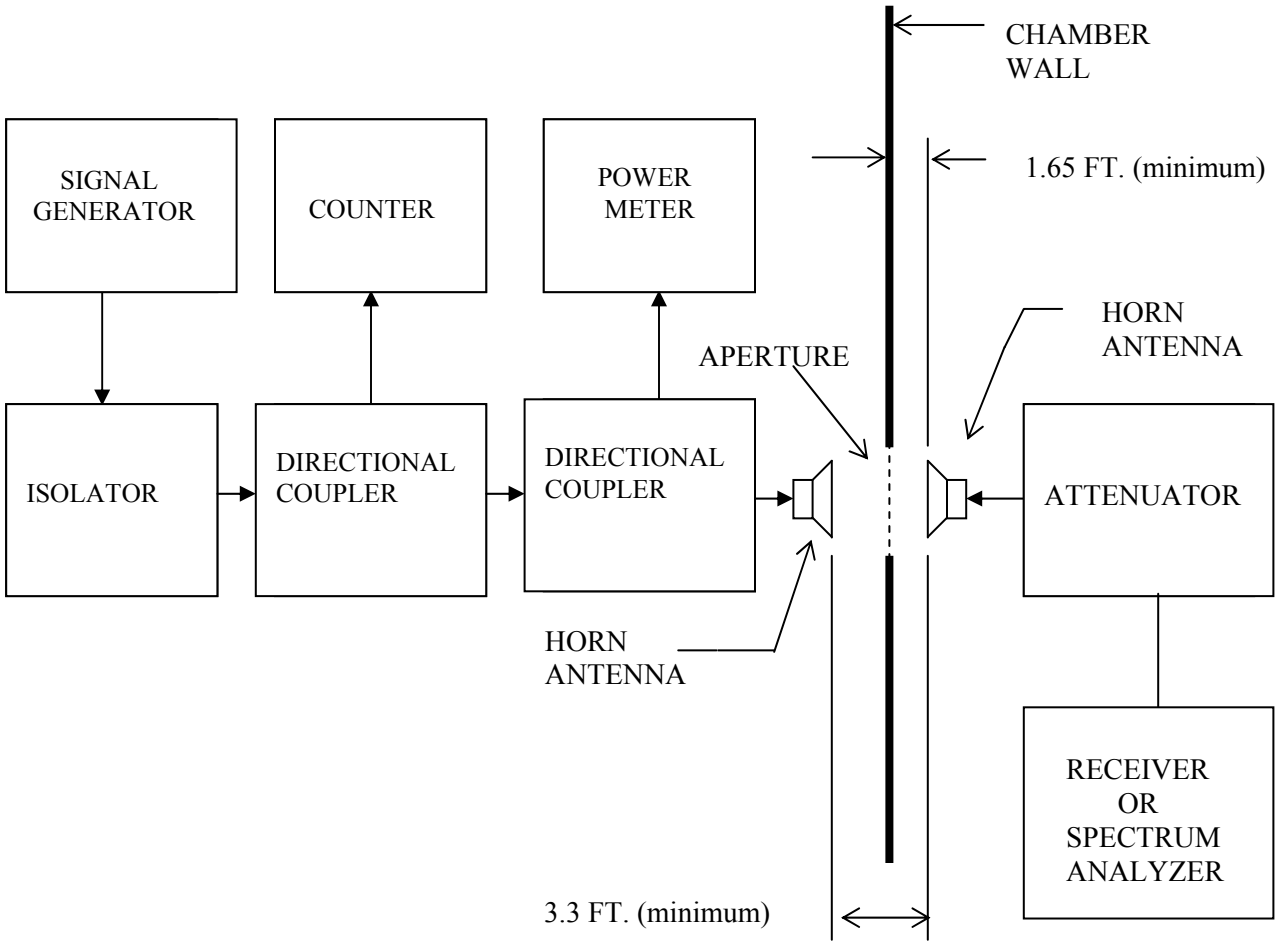


FIGURE 3. Test set-up for determining EMI attenuation characteristics (block diagram).

4.6.8 Surface resistivity.

4.6.8.1 Test samples. Samples 8 by 12 inches shall be selected at random and in numbers to represent the variation of barrier material. Samples shall be selected across the length and width of the entire roll sample. A minimum of five samples are required.

4.6.8.2 Conditioning of test specimens. Test samples shall be conditioned by flexing the specimens in accordance with MIL-STD-3010, Method 2017, using the full stroke flexing motion. Test specimens shall then be cut from the flexed material and conditioned at 12 ± 3 percent relative humidity and 73 ± 5 °F for at least 48 hours prior to testing in the same environment.

4.6.8.3 Test environment. Perform tests in an atmosphere maintained at 73 ± 5 °F and 12 ± 3 percent relative humidity.

4.6.8.4 Test procedure. The testing procedure shall be in accordance with ASTM-D257. The flat specimen electrode configuration for measuring volume and surface resistance or conductance shall be used. Specimens shall be tested on the inner surface (heat seal side) and the outer surface of the barrier material. A surface resistivity value not within the range specified in table I, on any of the five specimens tested per sample shall be cause for rejection.

4.6.9 Electrostatic shielding test methods.

4.6.9.1 Voltage Test.

4.6.9.1.1 Test samples. Samples 8 by 12 inches shall be selected at random and in numbers to represent the variation of barrier material. Samples shall be selected across the length and width of the entire roll sample. A minimum of five samples are required.

4.6.9.1.2 Conditioning of test specimens. Test samples shall be conditioned by flexing the specimens in accordance with MIL-STD-3010, Method 2017, using the full stroke flexing motion. Test specimens 5 by 12 inches shall then be cut from the flexed material, folded to 5 by 6 inches, and heat sealed along the two shorter edges. Specimens shall then be conditioned at 12 ± 3 percent relative humidity and 73 ± 5 °F for at least 48 hours prior to testing in the same environment.

4.6.9.1.3 Test environment. Test shall be performed in an atmosphere maintained at 73 ± 5 °F and 12 ± 3 percent relative humidity.

4.6.9.1.4 Test procedure. The testing procedure shall be in accordance with the applicable appendix of EIA-541 (2 Probe Electrostatic Shielding Property Test). The test shall be performed at 1000 volts. A peak voltage higher than that specified in table I on any of the five specimens tested shall be cause for rejection.

4.6.9.2 Energy test.

4.6.9.2.1 Test specimens. Test specimens, selected at random from roll stock barrier material, shall be cut to 8 by 20 inches, folded to 8 by 10 inches, and heat sealed along the two shorter sides to form a bag. A minimum of six specimen bags are required.

4.6.9.2.2 Conditioning of test specimens. Test specimens shall then be conditioned at 12 ± 3 percent relative humidity and 73 ± 5 °F for at least 48 hours prior to testing in the same environment.

4.6.9.2.3 Test environment. Test shall be performed in an atmosphere maintained at 73 ± 5 °F and 12 ± 3 percent relative humidity.

4.6.9.2.4 Test procedure. The testing procedure shall be in accordance with ANSI/ESD 11.31 (Evaluating the Performance of Electrostatic Discharge Shielding Materials). An average energy for all six specimens higher than that specified in table I shall be cause for rejection.

4.6.10 Storage stability. After one year of sheltered storage at 75 ± 2 ºF and 50 ± 5 percent relative humidity, a sample of barrier material (or sheets, if applicable) shall be tested for conformance to the requirements of the following tests:

Seam strength, as received tests.
Surface resistivity, as received
Static decay, as received
Electrostatic shielding (Voltage and Energy tests)

5. PACKAGING.

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

6. NOTES

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

6.1 Intended use. The barrier materials covered by this specification are intended for use in specialized military methods of preservation. The combination of all performance characteristics of MIL-PRF-81705; electromagnetic interference attenuation; electrostatic shielding; static decay; water vapor transmission rate; surface resistivity; waterproofness; transparency; marking abrasion resistance; thickness; aging; seam strength and fabrication; breaking strength; puncture; blocking and curl resistance; contact corrosivity; delamination; water resistance of marking, provides the necessary requirements for protection from exposure to the extremes of the navy/naval aviation environment. Navy/naval aviation items are exposed to high moisture, high salt concentration, transfer at sea, rough handling, and minimal storage conditions. There are no commercial equivalents that meet the physical, mechanical, and corrosion requirements necessary to protect materiel that is exposed to the operational naval aviation environment. Specifically, Specialized Method of Preservation, GX of MIL-STD-2073-1E use MIL-PRF-81705 as the premier source of barrier materials that provide watervaporproof and electrostatic discharge protection for applicable items encountering the above conditions. MIL-PRF-81705 provides the building blocks for applying Electrostatic Discharge Protective techniques approved under MIL-STD-2073-1E.

6.1.1 Type I use. Type I barrier material is intended for use for watervaporproof, electrostatic and electromagnetic protection of microcircuits and semiconductor devices, such as diodes, field effect transistors, and sensitive resistors.

6.1.2 Type III use. Type III barrier material is intended for use where a transparent, waterproof, electrostatic-protective and electrostatic field protective barrier is required. Use of type III material is limited to an intimate wrap or bag.

6.1.3 Class 1 use. Class 1 materials have no significant tendency to curl and could be heat-sealed using hand operated heat-sealing equipment and automated heat-sealing equipment.

6.1.4 Class 2 use. Some Class 2 materials have a strong tendency to curl, but are suitable for automated heat-sealing equipment. Class 2 materials should not be sealed with hand operated equipment since this results in compromised heat-seals due to the difficulty in holding curling surfaces in the proper position by hand.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of the specification.

b. Type and class of barrier material (see 1.2).

c. Form (rolls of tubing or sheeting or flat cuts) and size required (see 3.4).

d. Packaging requirements (see 5.1).

6.3 Heat-seal equipment. In the interest of standardization and for ease of manipulation, all seals for test under this specification should be effected on a jaw-type heat-sealer. This, however, should not be construed as an indication of Governmental preference in regard to sealing equipment. It is not intended that the operating temperature of heat-sealing equipment be limited to 525 °F or less. While equipment may be operated at temperatures exceeding 525 °F to accomplish a seal, the barrier material must also be capable of being heat-sealed at temperatures of 525 °F or less.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL-81705, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products and the letter of authorization for submittal of sample may be obtained from the Qualifying Activity: Commander, Naval Air Warfare Center Aircraft Division, Code 6.7.2.4, Building 596-2, Highway 547, Lakehurst, NJ 08733-5049. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at http://assist.daps.dla.mil.

Barrier material supplied under contract should be identical in every respect to the samples tested and found to meet the requirements of this specification. Any unapproved changes from the qualification sample should constitute cause for rejection for material submitted and for removal from the list of qualified products. However, acceptability under this specification is based on the performance characteristics of the barrier material, and since there is no color requirement, it is not mandatory that the color of the visible surfaces of the material supplied under contract be the same as the samples tested and accepted by the qualifying activity.

6.5 Conformance inspection lot. For purposes of sampling, an inspection lot for examinations and tests should 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.

6.6 Material safety data sheets (MSDS). Contracting Officers will identify those activities requiring copies of completed material data safety sheets prepared in accordance with FED-STD-313. The pertinent government mailing addresses for submission of data are listed in FED-STD-313; and 29 CFR 1910.1200 requires that the material safety data sheet for each hazardous chemical used in an operation must be readily available to personnel using the

material. Contracting Officers will identify the activities requiring copies of the material safety data sheet.

6.7 Metric conversion factors. Metric conversion factors are referenced in FED-STD-376.

6.8 Subject term (key word) listing.

Electromagnetic Interference
Packaging
Preservation
Water Vapor Transmission

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

CONCLUDING MATERIAL

Custodians:
Army - GL
Navy - AS
Air Force - 69
DLA - CC

Review activities:
Army – CR, SM
Navy – OS, SA, SH
Air Force – 11, 70, 84

Preparing activity:
Navy - AS

(Project 8135-2009-006)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil.