

PPP-B-1055B

June 10, 1975

~~SUPERSEDING~~

Fed. Spec. PPP-B-1055A

October 14, 1970 and

MIL-P-20311A

7 June 1963

FEDERAL SPECIFICATION

BARRIER MATERIAL, WATERPROOFED, FLEXIBLE

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers barrier materials for use in packaging and packing applications which require waterproofness plus a high degree of resistance to permeation by water vapor (see 6.1).

1.2 Classification. The waterproof barrier material covered by this specification shall be of the following classes, as specified (see 6.2).

B-1	- Baling and interior wraps
B-2	- Baling and interior wraps
B-3	- Baling and interior wraps
C-1	- Interior wraps
C-2(a)	- Crate liners and interior wraps
E-1	- Interior wraps and crate liners
E-2	- Interior wraps, crate liners, shrouds, and baling
H-2	- Case liners
H-3(a)	- Case liners
H-4	- Case liners
H-5	- Case liners, shrouds and crate liners
L-2(b)	- Case liners and crate liners
L-4	- Temporary tarpaulins
M-1	- Case liners, shrouds and crate liners
P-1	- Ammunition containers

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2. APPLICABLE DOCUMENTS

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

Federal Specifications:

- MMM-A-260 - Adhesive, Water-Resistant, (For Sealing Waterproofed Paper)
- PPP-B-636 - Boxes, Shipping, Fiberboard

Federal Standard:

- FED-STD-123 - Marking for Domestic Shipment (Civil Agencies)

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies).

Military Specifications:

- MIL-A-3029 - Asphalt, Waterproofing (For Use in Manufacture of Fiber Ammunition Containers)
- MIL-C-3955 - Cans, Fiber, Spirally Wound

Military Standards:

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

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(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring 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. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply:

Technical Association of the Pulp and Paper Industry (TAPPI) Standards

T402	- Conditioning for Testing
T403	- Bursting Strength of Paper
T404	- Tensile Breaking Strength of Paper and Paperboard
T411	- Thickness and Density of Paper
T457	- Stretch of Paper and Paperboard
T475	- (Bleeding Resistance)
T448	- Water Vapor Permeability of Paper and Paperboard
T414	- Internal Tearing Resistance of Paper
T803	- Puncture and Stiffness Test of Container Board
T433	- Water Resistance of Paper and Paperboard (Dry Indicator Method)

(Application for copies should be addressed to the Technical Association of the Pulp and Paper Industry, One Dunwoody Park, Atlanta, GA 30341).

National Motor Freight Traffic Association, Inc., Agent

National Motor Freight Classification

(Application for copies should be addressed to the American Trucking Associations, Inc., Tariff Order Section, 1616 P Street, N.W., Washington, DC 20036).

Uniform Classification Committee, Agent

Uniform Freight Classification

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606).

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3. REQUIREMENTS

3.1 Material. The barrier material covered by this specification shall consist of two or more layers of kraft paper laminated with asphalt, with or without reinforcing cords or strands, and shall conform to the requirements of this specification. The kraft paper (for classes C-1, C-2(a), E-1, L-2(b) only) may contain fibers reclaimed from the sources listed in 6.5.

3.1.1 Asphalt, for class P-1. The waterproofing asphalt for class P-1 shall be as specified in MIL-A-3029.

3.2 Form, length, and width. The barrier material shall be either furnished in roll form in lengths of 100 or 200 yards and in widths of 36, 48, 60, 72, or 84 inches, or in sheet form in 36 inch x 100 inch sheets unless otherwise specified in the contract or purchase order (see 6.2).

3.2.1 Rolls. The rolls shall be uniformly and smoothly wound on non-returnable cores having a minimum inside diameter of 3 inches, with a plus 1/8 inch tolerance, and shall be suitably restrained to prevent unwinding. The length of the core shall be equal to the specified width of the roll, with a plus 1/4 inch tolerance. The cores shall be protected by fitted plugs at each end, and shall be of sufficient rigidity to prevent distortion of the roll under normal conditions of transportation and use.

3.2.2 Tolerances. The average length of the rolls or sheets shall be not less than the length specified. For unstretchable material, a tolerance of minus 1/4 and plus 1/2 inch will be permitted in width; and for material stretchable in width direction, a tolerance of minus 1/2 inch and plus five percent of the specified width will be permitted.

3.2.3 Splices. For barrier material which is unstretchable or stretchable in one direction only, no more than 10 percent of the rolls within an inspection lot shall contain splices. For barrier material which is stretchable in two directions, no more than 50 percent of the rolls within an inspection lot shall contain splices. No roll shall contain more than two splices (3 pieces) and no piece shall be less than 20 yards in length. Splices shall be evenly and neatly made the entire width of the roll and shall be flagged at both ends with bright colored markers to indicate splices within the roll.

3.3 Construction. The composite sheet of waterproof barriers furnished shall conform to the requirements of table I. An unasphalted area extending not more than 1/2 inch from one edge or a total of 1/2 inch from both edges of the roll will be permitted, except for Class P-1. Class P-1 shall have both edges of the paper completely and uniformly laminated when wound into rolls for container manufacture.

3.3.1 Thickness, class P-1. The class P-1 paper shall be constructed of two equal thicknesses of kraft paper laminated with asphalt and shall have a finished thickness of 0.007 ± 0.0005 inch when tested as specified in 4.3.2.

3.4 Physical properties. The barrier material shall conform to the requirements of table II when tested as specified in 4.3.2.

3.4.1 Stretch. The stretch requirement for classes B-1, B-2, B-3, H-2, H-3(a), H-4, H-5 and M-1 shall be met by creping, pleating, or corrugating processes. The stretch requirement for classes E-2 and L-4 shall be met by creping, pleating, or corrugating processes or by the use of extensible kraft paper.

3.4.2 Bursting strength, class P-1. The minimum average bursting strength of the class P-1 paper shall be 55 pounds per square inch (P.S.I.), when tested as specified in 4.3.2.

3.5 Sealability. Materials submitted for fabrication of case liners, interior shrouds or interior wraps (all classes except B-1, B-2, B-3 and L-4) shall be capable of being sealed by adhesives, pressure sealing, or taping to effect water resistance of joints and closures equal to the material itself. The sealed material when tested as specified in 4.3 shall have the water resistance indicated in table II. The manufacturer shall tag each roll with his recommended sealing procedure and the following information:

"DO NOT SEAL WITH SOLVENT BASE ADHESIVES"

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TABLE I. Construction and basis weight of paper

Class	Basis weight <u>1/</u> (24 by 36 inches - 500 sheets) prior to creping or treating			
	Paper pounds	Asphalt pounds	Paper pounds	Asphalt pounds
B-1	40	50	60	--
B-2	30	50	30	--
B-3	30	50	30	--
C-1	30	50	30	--
C-2(a)	50 <u>2/</u>	60	50	--
E-1	30	80	30	--
E-2	30	100	30	--
H-2	30	100	30	100
H-3(a)	50 <u>2/</u>	80	50	--
H-4	30	120	30	--
H-5	40	160	40	--
L-2(b)	50 <u>2/</u>	50	50	--
L-4	40	50	40	--
M-1	30	75	30	75
P-1	30	40	30	--

1/ A minus 5 percent tolerance will be permitted and any basis weight which exceeds that specified shall be acceptable.

2/ For classes C-2(a), H-3 and L-2(b) paper having basis weights of 60 and 40 pounds (24 by 36-500) may be used in place of the cwc 50 pound papers provided all other characteristics remain the same.

TABLE II. Physical properties

Classes	Average tensile strength each direction, minimum	Average stretch in one direction, minimum	Average stretch in other direction, minimum	Average water resistance creased, minimum 1/	Average stiffness more flexible direction, maximum	Tearing resistance average of both directions, minimum	Av. water vapor permeability creased, maximum 2/	Av. punct. resistance average of both directions, minimum	Seal-ability water resistance, average, minimum	Gm/	Gm/	
											Percent	Hours
	Loz/inch width	Percent	Percent	Hours	Crams	Crams	Crams	Units	Hours		Hours	
B-1	16	15	15	4	600	--	--	--	--		--	
B-2	12	15	15	4	300	--	--	--	--		--	
L-3	12	25	--	4	300	--	--	--	--		--	
C-1	20	--	--	12	300	--	--	--	--		12	
C-2 (a)	36	--	--	12	--	--	--	--	--		12	
L-1	36	--	--	12	--	--	--	--	--		12	
B-2	36	8	--	12	600	--	--	--	--		12	
H-2	25	20	8	17	600	400	10	--	--		12	
H-3 (a)	32	10	--	12	300	--	--	--	--		12	
H-4	26	10	--	12	300	--	--	--	--		12	
H-5	17	20	20	10	600	400	10	--	--		16	
H-6	36	--	--	12	600	--	--	--	--		12	

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TABLE II. Physical Properties (cont'd)

Class	Average tensile strength each direction, minimum	Average stretch in one direction, minimum	Average stretch in other direction, minimum	Average water resistance creased, minimum	Average stiffness more flexible direction, maximum	Tearing resistance average of both directions, minimum	Average vapor permeability creased, maximum	Average puncture resistance of both directions, minimum	Sealability water resistance, average, minimum
	Lbs./inch width	Percent	Percent	Hours	Grams	Grams	Gm/sq. meter/24 hr. 2/	Units	Hours
L-4	36	10	--	16	600	---	--	--	--
M-1	40	12	--	16	600	400	20	40	16
P-1	--	--	--	--	--	--	--	--	--

1/ The water resistance accredited to any one test specimen, in computing the average, shall be as follows:

- (a) For classes B-1, B-2 and B-3, shall not exceed 6 hours
- (b) For classes C-1, C-2(a), E-1, E-2, H-2, H-3(a), H-4, and L-2(b), shall not exceed 16 hours
- (c) For classes H-1, H-5, L-4, and M-1, shall not exceed 20 hours

2/ To convert from SI units to gm/100 sq. in/24 hr, multiply by 15.50

3.6 Reinforcement. Class E-1, E-2, and L-4 barrier material shall be reinforced with cords or strands of fiber embedded in the laminating asphalt. The cords or strands shall run in two or three directions. There shall be at least 20 cords or strands per foot running in one direction, which for the purposes of this specification shall be called the first direction. Running in one or two other directions shall be a total of at least 20 cords or strands per foot. These cords or strands must cross the cords or strands running in the first direction at an average angle of 45° or greater. The angle of crossing shall be the smaller angle formed at an intersection.

3.7 Abrasion resistance. Both plies of class L-4 materials and one outer ply of classes H-2, H-4, H-3(a), H-5, L-2(b), and M-1 materials shall be treated to afford abrasion resistance when both wet and dry. This requirement may be accomplished by the use of wax, resin or other suitable materials (see 4.4.6). The treated side shall be marked with a distinguishing color, stripe or other marking. If both sides are treated, no identification shall be required.

3.8 Bleeding. When resistance to bleeding is specified (see 6.2), untreated sides of all classes of barrier materials shall show no more than staining in the form of a few isolated specks when tested as specified in 4.3.2.

3.9 Workmanship. The barrier material shall be uniformly constructed, free from dirt, holes, tears, cuts, creases, asphalt blotches, or other imperfections which impair its usefulness. The barrier material shall not stick together to such an extent as to cause tearing or injury to any surface when unrolled or sheets separated. The plies of paper shall show no delamination.

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 order, the supplier 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.

4.1.1 Inspection. Sampling for inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated hereinafter.

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4.1.2 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification. The contractor shall certify in writing to the contracting officer or his representative that the material offered to the Government contains the minimum percentage of reclaimed fiber required by 3.1.

4.2 Component and material inspection. In accordance with 4.1, components and materials shall be inspected and tested in accordance with all the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase documents.

4.3 Inspection of the end item.

4.3.1 Examination of the end item. The end item shall be examined for the defects set forth in the applicable subparagraphs at the inspection levels and acceptable quality levels (AQLs) in 4.3.1.6. Random samples shall be drawn from each inspection lot of the end item for examination of visual, dimensional, and preparation for delivery defects. The lot, for purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of yards for examination in 4.3.1.1 and in units of rolls for examination in 4.3.1.2 through 4.3.1.5.

4.3.1.1 Examination for visual defects. The sample unit of the roll form for this examination shall be one yard full width of the roll. No more than ten sample units shall be selected from any one roll, and no sample unit shall be taken from the first or last convolution of the roll. The sample unit of the sheet form shall be one sheet from a bundle. Both sides of the material shall be examined. Defects of each type shall be scored only once within a sample unit.

<u>Examine</u>	<u>Defect</u>
Class	Incorrect class of material
Appearance	Not clean, presence of any foreign matter; dirt, sand, smears, blotches, or oil spots Blister, crack, cut, puncture, tear, sharp creases, chafed spot or scuff mark, or hole (including pinhole for class H-1, H-2, H-5 and N-1 (see 4.3.1.1.1))

NOTE. These defects not applicable to the selvage.

	To determine presence of pinholes, material shall be examined by transmitted light to assure there are no pinholes in the laminating layer of material Asphalt layer not smooth or evenly applied
Workmanship	Edges not clean cut. Ragged, crushed, or uneven edges Evidence of delamination or embrittlement Number or combination of layers not in conformance with the requirement for the specified class of material (see table I) Reinforcing cords or strands cross those of the first direction (see 3.6) at an average of less than 45 degrees Total selvage on either one or both edges of rolls exceeds 1/2 inch Not unstretchable or stretchable as specified Stretch not obtained by the specified method Objectionable curl
Sealability	Manufacturer's sealing instruction not securely tagged to roll
Identification marking (as applicable)	Treated ply not marked or colored as specified (see 3.7)

4.3.1.1.1 Examination for pinholes (classes H-2, H-5 and M-1 only).
Examination for pinholes shall be made by viewing the surface of the barrier material held under light tension using the tru-light equipment (light table) described below. During the examination, when the surface of the barrier material is in contact with the light table, the illumination in the darkened area shall not exceed 25 foot-candles of natural, artificial or a combination of natural and artificial light (see 6.4). A pinhole is defined as any opening (transparent) observed in the material under the conditions specified above, even though it may not be visible when the material is viewed normally in average daylight.

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Light table. The light table shall have a clear glass top and shall be illuminated with a minimum of two 25 watt fluorescent tubes. The tubes shall be positioned 9 to 10 inches below the glass top, and 6 to 8 inches from the sides and ends of the light housing. The spacing between tubes shall be 5 to 6 inches and the interior of the light housing shall be flat white.

4.3.1.2 Examination for defects in dimension. The sample unit for this examination shall be one roll or one sheet.

<u>Examine</u>	<u>Defect</u>
Unstretchable	Varies by more than minus 1/4 or plus 1/2 inch from width specified
Stretchability	Varies from minimum average requirement in two directions (see table II)
Core length (roll form)	Length less than specified width of roll or greater by more than 1/4 inch
Diameter (roll form)	Inside diameter less than 3 or more than 3-1/8 inches

4.3.1.3 Examination for defects in roll or sheet construction. The sample unit for this examination shall be one roll or one sheet.

<u>Examine</u>	<u>Defect</u>
Assembly of roll	Not suitably restrained to prevent unwinding Material not wound uniformly and evenly on roll causing uneven edges or telescoping of roll Material not wound on a substantial rigid core; core broken, collapsed, crushed or mutilated Plugs omitted from one or both ends of core, do not fit properly; too loose to the extent that plug(s) fall in or out of opening
Unwinding of roll (examine both sides)	When unwound, material sticks together causing tearing or injury to either surface Roll wound unevenly causing wrinkles, sharp creases, or folds within roll

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Splices
(roll form)

Roll contains more than two splices;
more than one splice in any 20 consecutive yards
Splice(s) not neatly and evenly made;
not full width of roll; comes apart during unwinding
Splice not flagged at both ends with bright colored marker

Separating
of sheets

When separating sheets, material sticks together causing tearing or injury to each surface

4.3.1.3.1 Examination for number of rolls containing splices. This examination shall be performed in two steps. The first step shall be to count all rolls that are flagged and this will determine the percentage of rolls containing splices. The second step will be to sample the unflagged rolls in accordance with the inspection level of 4.3.1.6. The lot shall be considered as failing this examination if any sample rolls are found to contain one or more splices or if the total number of spliced rolls exceeds the number permitted in 3.2.3. This examination shall be made prior to packing the rolls.

4.3.1.4 Examination for length of roll. The sample unit for this examination shall be one roll. For determining the length of roll, place a counter against the roll of material in such a manner as to avoid any undue tension that would cause removal of any pleat, crepe or corrugation while unwinding the roll. The lot shall be unacceptable if the average length per roll for all rolls examined is less than specified.

4.3.1.5 Examination of preparation for delivery requirements. An examination shall be made to determine that the packing and marking complies with the section 5 requirements. Defects shall be scored in accordance with the list below. The sample unit for this examination shall be one roll fully packed, selected just prior to the sealing operation or one shipping container fully prepared for delivery with the exception that it need not be closed. Sealed rolls shall be examined for closure defects.

Examine

Defect

Marking
(exterior)

Incorrect; incomplete; illegible; omitted, of improper size, location, sequence, or method of application

Material

Any component missing, damaged, or not as specified

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Workmanship	Inadequate application of components, such as: loose or inadequate sealing, wraps, or headers. Bulged or distorted containers
Weight	Weight of container greater than that specified

4.3.1.5.1 Examination of shipping container. When shipping containers are required to comply with PPP-B-636, examination for defects in the closure, waterproofing and reinforcing shall be in accordance with the appendix of the box specification.

4.3.1.6 Inspection levels and acceptable quality levels (AQLs) for examination. The inspection levels for determining the sample size and AQLs expressed in defects per one hundred units shall be as follows:

<u>Examination paragraph</u> 1/	<u>Inspection level</u>	<u>AQLs</u>
4.3.1.1	I	2.5
4.3.1.2	S-2	2.5
4.3.1.3	S-4	4.0
4.3.1.3.1	S-4	N/A
4.3.1.4	S-2	N/A
4.3.1.5	S-1	2.5

1/ The same rolls may be used for examinations under 4.3.1.2, 4.3.1.3 and 4.3.1.4 and may be within the rolls randomly selected for examination under 4.3.1.1.

4.3.2 Testing of the end item. The end item shall be tested for the applicable characteristics in table III. Unless otherwise specified, specimens for test shall be conditioned in accordance with TAPPI Standard T402 except the conditioning time shall be not less than 48 hours. Test reports shall include all values upon which results are based and there shall be no failure to meet the sample unit or lot average requirements in any test for lot acceptability.

<u>Lot size</u>	<u>Sample size</u>
800 or less	2
801 up to and including 22,000	3
22,001 or more	5

4.3.2.1 Roll form. The sample unit shall be drawn from any one roll. The lot shall be expressed in units of rolls. For purposes of sampling, a lot shall consist of all material of one class and size. The sample size shall be as shown above.

4.3.2.2 Sheet form. The sample shall include only one sheet from a bundle. For purposes of sampling, a lot shall consist of all material of one class and size. The sample size shall be as shown in 4.3.2.

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TABLE III. Instructions for testing of the end item

Characteristic	Specification reference		Requirements Applicable to		Number determinations per sample unit	Results reported as	
	Requirement	Test method	Single unit	Lot avg		Pass or fail	Numerically to nearest
Basis weight, 24 x 36-500, pounds							
Paper	Table I	4.4.1	X		10		0.5 pound
Asphalt	Table I	4.4.1	X		10		0.5 pound
Basis weight, total (paper and asphalt)							
Creped, 24 x 36-500, pounds		4.4.1	X		10		0.5 pound
Tensile strength							
Machine direction	Table II	T404 1/	X		Average of 5		0.1 lb./inch width
Cross direction	Table II	T404	X		Average of 5		0.1 lb./inch width
Bursting strength (class P-1)	3.4.2	T403	X		Average of 5		--
Thickness (class P-1)	3.3.1	T411	X		Average of 5		--
Stretch (elongation)							
Machine direction	Table II	T457 2/		X	Average of 5		0.5 percent
Cross direction	Table II	T457		X	Average of 5		0.5 percent
Creasing for water resistance and water-vapor permeability tests	Table II	4.4.7	--	--	--		--

TABLE III. Instructions for testing of the end item

Characteristic	Specification reference wire- ment	Test method	Requirements		Number of determinations per sample unit	Results reported as	
			Applicable to Single unit	Lot avg		Pass or fail	Numerically to nearest
Water resistance, creased, hours ^{3/}	Table II T433		X		Average of 10		Hour
Water vapor permeability, creased, gm/sq meter/ 24 hours ^{4/}	Table II T448		X		Average of 10		Gram
Stiffness, grams	Table II 4.4.2		X		Average of 10		Gram
Tearing resistance, grams	Table II T414		X		Average of 10 (5 in each direction)		Gram
Fracture resistance, units	Table II T803		X		Average of 10 (5 in each direction)		Unit
Sealability water resistance	Table II 4.4.4		X		Average of 2		Hour
Reinforcement one direction	3.6 4.4.5	X			1	X	1 strand per foot
Bleeding	3.8 T475	X			1	X	Degree

^{1/} Denotes TAPPI test method number.

^{2/} May be tested simultaneously with tensile strength.

^{3/} After conditioning for 2 hours at $40^{\circ} \pm 2^{\circ}\text{F}$. and 60 ± 2 percent relative humidity.

^{4/} At 90 ± 2 percent relative humidity and $100^{\circ} \pm 1^{\circ}\text{F}$. To convert from SI units to gm/100 sq. in/24 hr, multiply by 15.50.

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4.4 Test procedures.4.4.1 Basis weight of paper and asphalt.

4.4.1.1 Procedure. Cut specimens exactly 2 by 5 inches from each sample unit. These specimens shall be taken from same sample sheets as the specimens used for tensile elongation test. The total weight of the specimens shall be obtained by weighing on an analytical balance. Fold the specimens in accordion pleats parallel to the two inch dimensions, then place them in a suitable extraction apparatus such as a Soxhlet or Underwriters. Extract the asphalt with a suitable solvent such as petroleum ether, or trichloroethylene until the extract is practically colorless. Allow the paper to dry, then recondition and reweigh. Where different basis weight papers have been used for the top, bottom, or interior plies, weigh and record the weight for each ply separately. From this weight, calculate the basis weight (24 by 36-500) of the paper to the nearest 0.5 pound and from the difference between this weight and the original weight, calculate the basis weight of the asphalt used in the laminate. For classes H-2 and M-1, wherein two plies of asphalt are stipulated, only one asphalt weight can be obtained. The weight shall be the total of the two plies of asphalt specified in table I. The asphalt shall include any other materials that may be extracted by the solvent. When any of the paper plies are creped or corrugated, the basis weight, required for conformance to the requirements listed in table I, shall be determined as specified in 4.4.1.2.

4.4.1.2 Uncreped basis weight. The uncreped basis weight of asphalt and each ply of paper shall be calculated using the following equations:

$$A = \frac{B}{\frac{(1 + C)}{100} \times \frac{(1 + D)}{100}}$$

Where:

- A = Uncreped basis weight
- B = Creped basis weight
- C = Percent stretch in one direction
- D = Percent stretch in other direction

NOTE: If paper is creped in only one direction, eliminate the second multiple of the denominator.

4.4.2 Stiffness.

4.4.2.1 Apparatus. The test shall be made with two stirrups which are attached to the tensile tester described in T404 for the purpose of finding the load required to force the paper between two rolls. A single stirrup, the crossbar of which is a 1/2 inch metal tube, four inches long, is fastened in the upper clamp of the tensile tester. An inverted double stirrup, which is fastened in the lower clamp of the tensile tested, has two 7/8 inch parallel rollers, separated by a distance of 3/4 inch. The rollers are 4-1/4 inches long. The tensile tester, with pendulum weights removed, is calibrated over the desired range by hanging small weights to the upper clamp, with the single stirrup in place.

4.4.2.2 Procedure. Run the lower clamp of the tensile tester up until the tubular crossbar of the upper stirrup passes between the rollers of the lower stirrup and comes below them. Slip a specimen of the paper four inches square under the rollers of the double stirrup and over the tubular crossbar of the single stirrup. Run the lower clamp down, bending the specimen, and pulling it between the rollers of the double stirrup. The force required to do this, which is calculated from the scale reading and the calibration of the tensile tester, is the stiffness. The average of the test values for not less than 10 specimens shall be reported as the stiffness. For papers with dissimilar surface treatment, the flexibility test shall be made with the treated surface down.

4.4.3 Puncture resistance. The puncture resistance of the barrier material shall be determined in accordance with TAPPI Method T803.

4.4.4 Sealability.

4.4.4.1 Samples. Cut four specimens 3 by 3 inches from each sample unit. Make two samples from these by placing one specimen on top of the other to form an overlap of one inch. Make a 3/4-inch wide continuous seam in the overlap area using the manufacturer's recommended sealing procedure.

4.4.4.2 Procedure. The samples prepared as specified in 4.4.4.1 shall then be tested for water resistance in accordance with T433. If tapes or seals are used, the samples shall be floated on the water, tape side down. If adhesives are used, either side may be floated on the water.

4.4.5 Reinforcement. Cut a specimen 3 by 7 inches from each sample unit. Immerse one end (approximately 3 inches square) in a suitable solvent such as trichloroethylene for about 15 minutes. Discard the solvent and repeat the extraction until the plies can be separated and the reinforcing strands are visible. Avoid excessive agitation in order to preserve as nearly as possible the relative number and spacing of the strands. Count the strands and report as the number of strands per lineal foot in each direction.

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4.4.6 Abrasion resistance. The supplier shall submit a certificate of compliance stating that the material has been treated for abrasion resistance as specified in 3.7. The statement shall include the material used to impart the abrasion resistance and the amount used as pounds of material per pounds of paper.

4.4.7 Creasing for water resistance and water-vapor permeability.

4.4.7.1 Samples. Cut samples in accordance with the specified procedure. Condition samples for 2 hours at $40^{\circ} \pm 2^{\circ}\text{F.}$ and 60 ± 3 percent relative humidity before creasing.

4.4.7.2 Apparatus. The apparatus shall consist of a smooth, flat base plate having hinged to it at one edge a top plate capable of matching and surfacing the base plate, and weighing 10 pounds.

4.4.7.3 Procedure. Fold the test specimen without creasing it so that corners of the sheet diagonally opposite coincide. Place the folded specimen on the base plate of the apparatus with the fold toward the hinge. Position the top plate so that its center is directly above the fold, lower it on the specimen, and allow it to remain on the specimen for 30 seconds. At the end of this period, remove the specimen and repeat the procedure to make a crease on the other side of the specimen, at right angles to the first crease.

4.4.8 Bursting strength. The bursting strength of P-1 barrier material shall be determined in accordance with TAPPI Method T403.

5. PREPARATION FOR DELIVERY

5.1 Packing. Packing shall be level A, B or C as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Paper sheets. Paper sheets of one description only shall be packed in a snug-fitting fiberboard shipping container conforming to style RSC grade V2s of PPP-B-636. Each fiberboard shipping container shall be closed in accordance with method III, waterproofed in accordance with method V and reinforced as specified in the appendix of PPP-B-636. The weight of contents of each shipping container shall not exceed 65 pounds.

5.1.1.2 Paper rolls. Each roll shall be wrapped overall with one thickness of barrier material covered by this specification, except when class C-1 is used, two thicknesses shall be required. The wrapper shall be closed at the ends by means of inside and outside headers. The seams of the wrapper and headers shall be sealed with a water-resistant adhesive conforming to MMM-A-260, using sufficient adhesive to effect a watertight seal.

5.1.2 Level B.

5.1.2.1 Paper sheets. Paper sheets of one description only shall be packed in a snug-fitting fiberboard shipping container conforming to style CSC, type CF (variety SW) or SF, class domestic, grade 275 of PPP-B-636. Each shipping container shall be closed in accordance with method II as specified in the appendix of PPP-B-636. The weight of contents of each shipping container shall not exceed 65 pounds.

5.1.2.1.1 When specified (see 6.2), the shipping container shall be a grade V3c, V3s or V4s fiberboard box fabricated in accordance with method III as specified in the appendix of the container specification.

5.1.2.2 Paper rolls. Each roll shall be wrapped overall with kraft paper having a minimum basis weight of 60 pounds per ream (24 by 36-500). Alternatively, the wrap may be two thicknesses of 30 pound kraft paper or barrier material covered by this specification. The wrapping shall be closed at the ends by means of inside and outside headers. The seams of the wrapper and the headers shall be securely sealed with an adhesive commercially used for this purpose.

5.1.3 Level C (Commercial Packing). Barrier material shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies. The quantity per shipping container shall be the same as that normally used by the supplier for retail distribution. Containers shall comply with the Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable.

5.2 Marking. In addition to the marking required by 5.2.3, shipping containers and wrapped rolls shall be marked in accordance with 5.2.1 or 5.2.2 as specified (see 6.2).

5.2.1 Civil agencies. In addition to any special marking required by the contract or order, shipping containers and wrapped rolls shall be marked in accordance with FED-STD-123.

5.2.2 Military requirements. In addition to any special marking required by the contract or order, shipping containers and wrapped rolls shall be marked in accordance with MIL-STD-129.

5.2.3 Precautionary marking. Each shipping container and wrapped roll shall be marked in minimum 3/4 inch high letters as follows:

"KEEP COOL AND DRY"

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6. NOTES

6.1 Intended use. The intended uses of the waterproofed barrier material covered by this specification are as follows:

6.1.1 Baling (classes B-1, B-2, B-3 and E-2). Baling is used for the purpose of prohibiting the entrance of water into the baled contents. In most instances, a plain kraft sheet of paper is first placed about the bale and that in turn is overwrapped in the waterproofed barrier. The ends of the baling are tied and the longitudinal edges are fully overlapped, folded, or sewn and held in position by wire straps around the bale.

6.1.2 Interior wraps (classes C-1, C-2(a), E-1 and E-2). Interior wraps are used to protect individual packages or light parts, or sections of parts, against penetration of water. In all cases, packages or parts protected by interior wraps are overpacked in boxes. All seams, joints, and closures are sealed with adhesives or other suitable materials to afford waterproofness equal to that of the interior wrap material itself. A minimum of 2-inch overlap should be provided at all overlapping edges.

6.1.3 Case liners (classes H-2, H-3(a), H-4, H-5, L-2(b) and M-1). Case liners are used for liners of boxes to protect contents against the entrance of water. Case liners are furnished as prefabricated or tailor made bags, (see type I, MIL-L-10547), with joints, seams, and closures sealed with adhesives or other suitable seals to afford water resistance equal to that of the barrier itself. Case liners, when closed and sealed, form an integral continuous barrier which is independent of the box itself.

6.1.4 Crate liners (class C-2(a), E-1, L-2, H-5, L-2(b) and M-1). Crate liners are used to line side, top and end panels or crates. Crate liners will usually be inserted between sheathing of the crate and inner diagonals, struts and braces. Unlike case liners, they are applied to separate panels and thus do not form an integral continuous barrier.

6.1.5 Shrouds (class E-2, H-5 and M-1). Shrouds are used to cover material packed in either open or fully sheathed crates, thus protecting them against penetration of water. In these applications, shrouds act as water sheds and are so constructed that they do not interfere with free circulation of air around the material. Shrouds are also applied to heavy parts or sections of parts requiring waterproof protection. The choice between interior shrouds or interior wraps for these applications will depend on the nature and size of the part or the section of the part requiring protection. Interior shrouds should be used in preference to interior wraps wherever a strong material is required.

6.1.6 Temporary tarpaulins (class L-4). Temporary tarpaulins are applied as coverings of material for outdoor storage to afford a watershed against the penetration of rain. Two or more widths of the waterproof barrier of the required length are sewn or bonded together to obtain the desired width of the temporary tarpaulin which will enable it to cover the top and sides of the material to be protected. Temporary tarpaulins are generally tied or weighted in position, or preferably attached to frames or to containers with wood holddown strips in such a manner as to permit the free circulation of air around the material and to avoid wind damage to the tarpaulin.

6.1.7 Ammunition containers (class P-1). The paper covered by class P-1 is used in fabrication of ammunition containers conforming to MIL-C-3955 - Cans, Fiber, Spirally Wound and MIL-C-2439 - Container, Ammunition, Fiber, Spirally Wound.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification
- (b) Class required (see 1.2)
- (c) Length and width required in sheet or roll form (see 3.2)
- (d) Whether bleeding resistance is required (see 3.8)
- (e) Selection of the applicable level of packing (see 5.1)
- (f) When weather resistant grade fiberboard shipping containers are required for level B shipments (see 5.1.2.1.1)
- (g) Marking required (see 5.2)

6.3 Supersession data. Class P-1 paper for ammunition containers was formerly covered by MIL-P-20311A - Paper, Kraft, Duplex, Waterproof, Wrapping (for Ammunition Containers). Class H-1 paper specified in PPP-B-1055A has been deleted from this revision of PPP-B-1055. Class M-1 paper may be substituted for the H-1 paper.

6.4 Instrument for measuring light intensity. An instrument that has proved satisfactory for measuring the illumination on the surface of the cloth is "Weston Illuminator Model 756 or 703, Type 8 with visor filter", made by Daystrom Inc., Weston Industries, Newark, NJ (see 4.3.1.1.1).

6.5 Reclaimed fiber sources.

Part I - Post-consumer wastes.

(i) Paper, paperboard, and fibrous wastes from factories, retail stores, office buildings, homes, etc., after they have passed through their end-usage as a consumer item, including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards, and used cordage.

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(ii) All paper, paperboard, and fibrous wastes that enter and are collected from municipal solid waste.

Part II - Manufacturing, forest residues, and other wastes

(i) Dry paper and paperboard waste generated after completion of the papermaking process (i.e., those manufacturing operations up to and including the cutting and trimming of the paper machine reel into smaller rolls or rough sheets) including: envelope cuttings, bindery trimmings, and other paper and paperboard waste, resulting from printing, cutting, forming, and other converting operations; bag, box, and carton manufacturing wastes; and butt rolls, mill wrappers, and rejected unused stock.

(ii) Finished paper and paperboard from obsolete inventories of paper and paperboard manufacturers, merchants, wholesalers dealers, printers, converters, or others.

(iii) Fibrous by-products of harvesting, manufacturing, extractive, or wood-cutting processes, flax straw, linters, bagasse, slash and other forest residues.

(iv) Wastes generated by the conversion of goods made from fibrous material, i.e., waste rope from cordage manufacture, textile mill waste, and cuttings.

(v) Fibers recovered from waste water which otherwise would enter the waste stream.

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